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# The Far Eastern Review

## ENGINEERING + FINANCE + COMMERCE

THE PIONEER IN ITS FIELD

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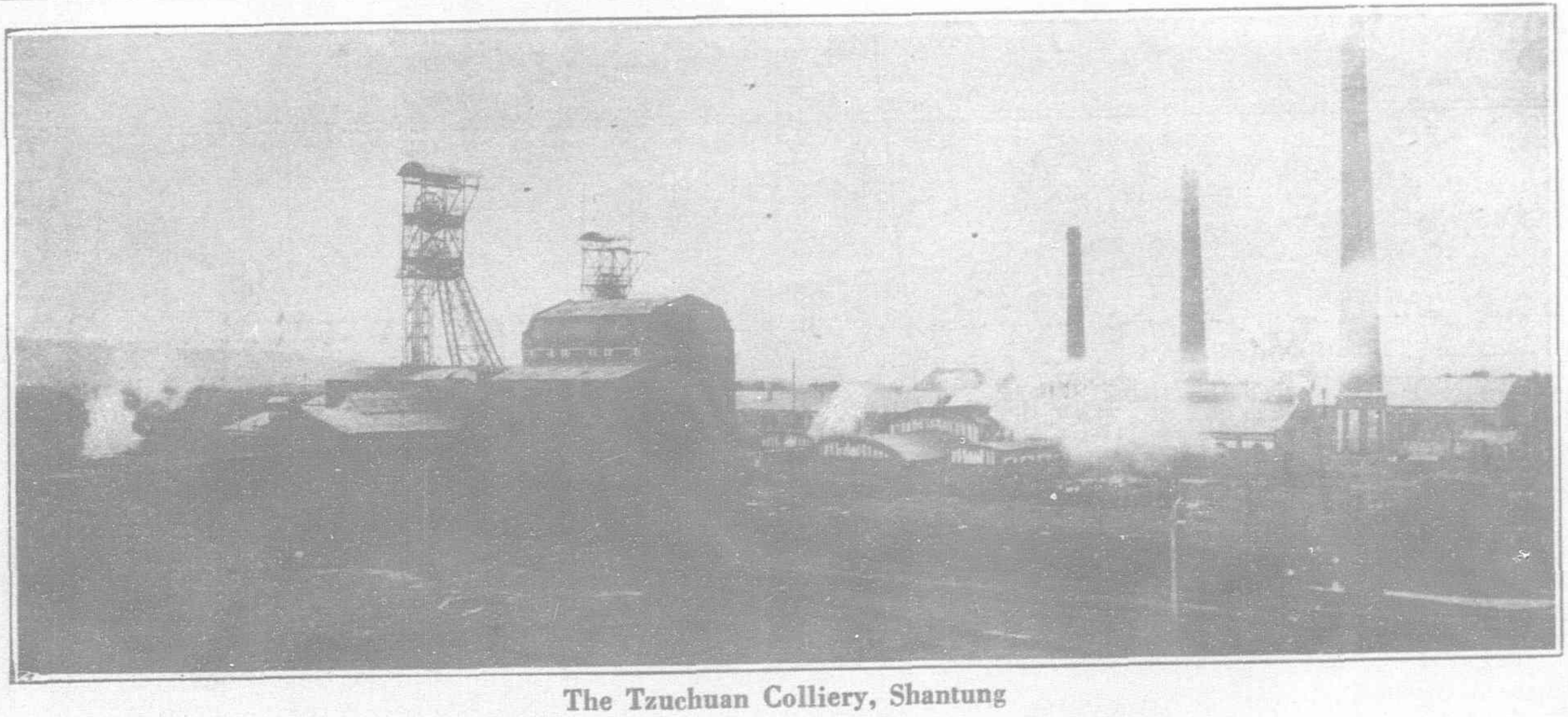

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# THE FAR EASTERN REVIEW

FINANCE ENGINEERING COMMERCE

上海仁記路第五號

遠東時報

THE CONSORTIUM

JAPAN'S WATER POWERS

RIVER CONSERVANCY

JAVA SUGAR INDUSTRY

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Vol. XVIII MAY, 1922 No. 5

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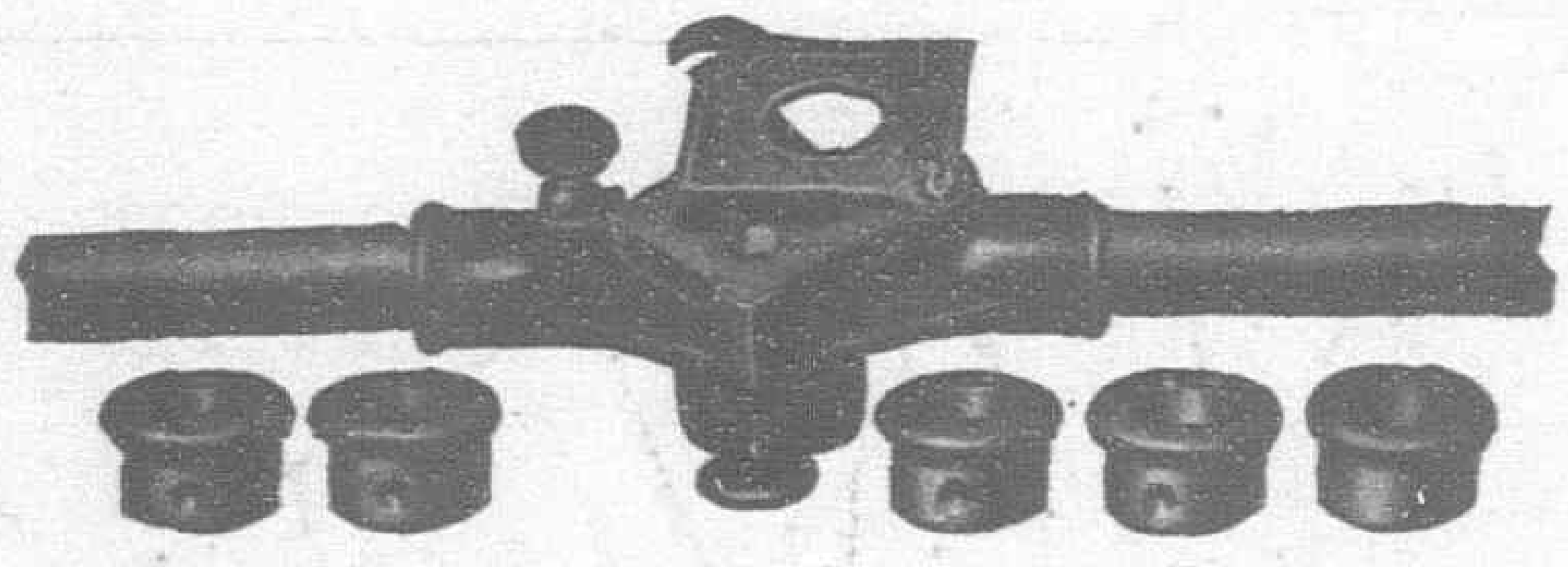

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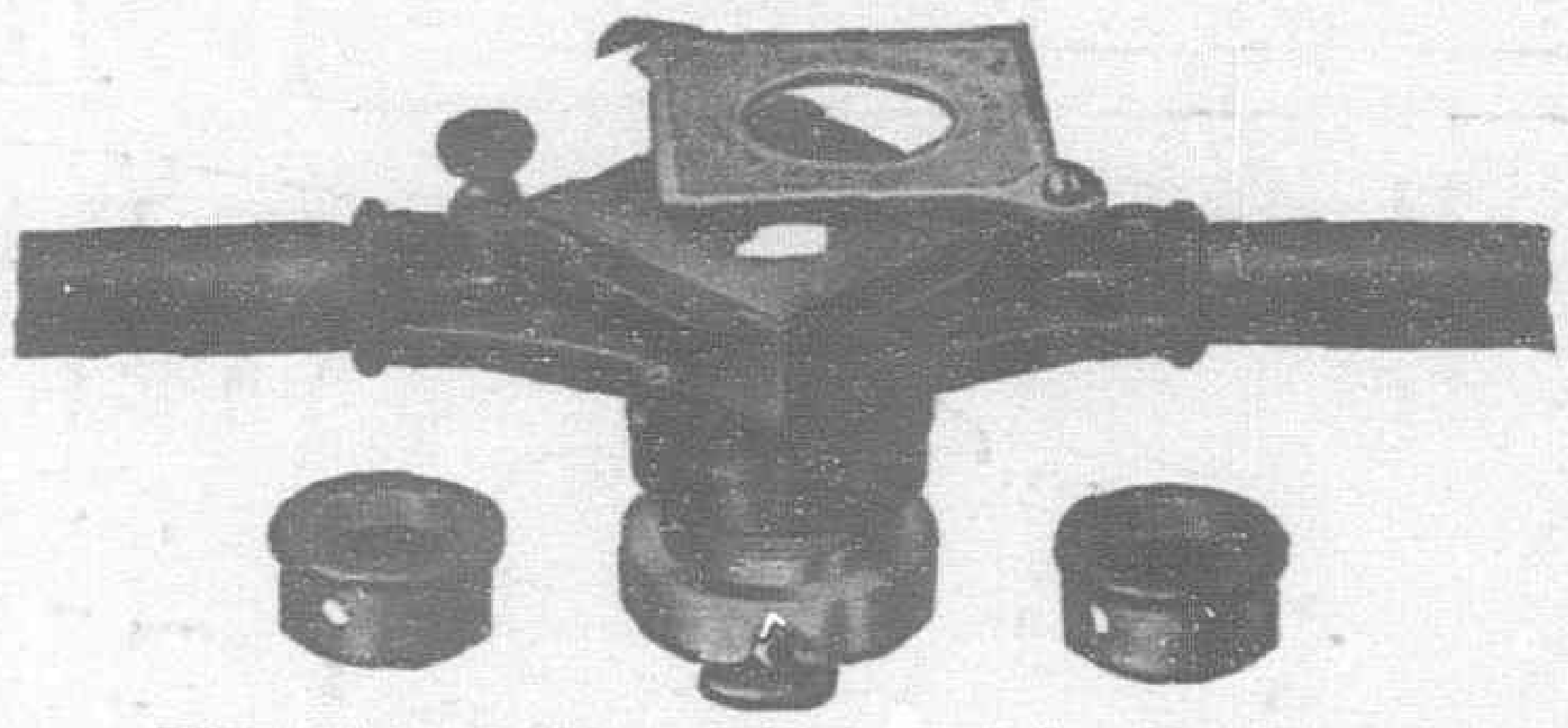

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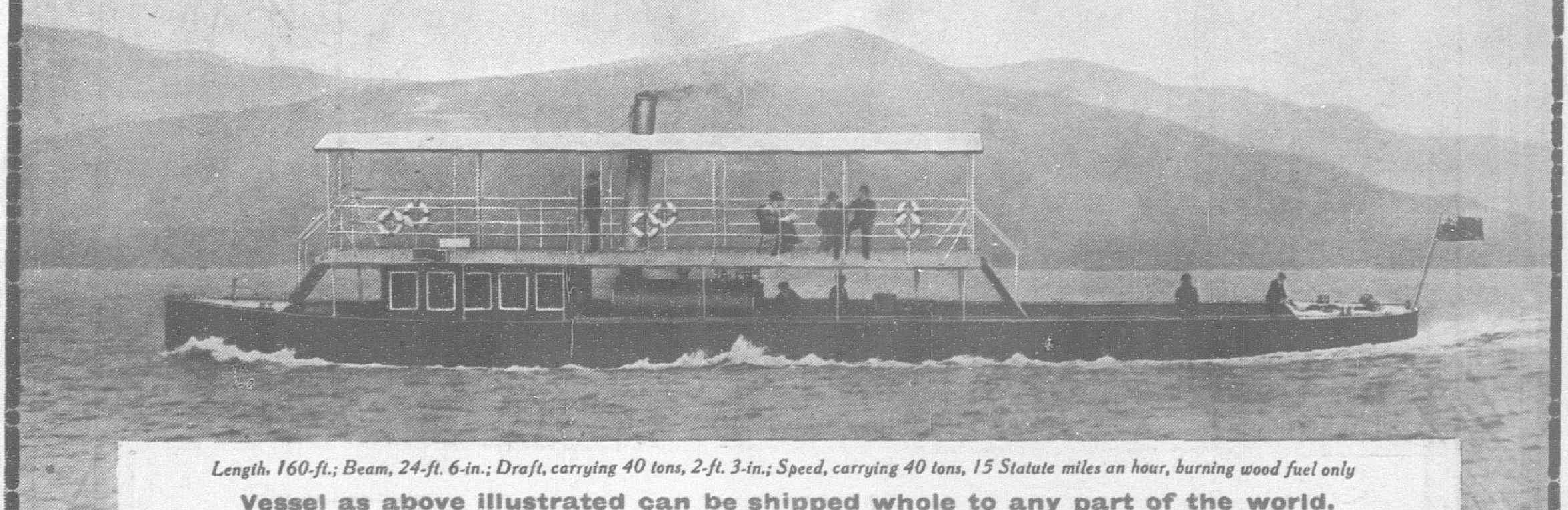

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, MAY, 1922 No. 5

# THE CONSORTIUM

## An Analysis of its Usefulness

IT is now three years since the first meeting of the consortium was held in Paris, and as yet it can hardly be said that any practical results have come out of this new alignment of international finance other than establishing a policy of international co-operation to supersede international competition, and a tightening of the international money market against indiscriminate and reckless borrowing on the part of China. Much water has passed under the mill since the consortium was organized. The results of the Washington conference have deprived it of political significance, superseding the agreements arrived at between the bankers by more effective understandings ratified into international law for a period of ten years. The consortium stands to-day as a purely business proposition supported by its various governments for the sole purpose of eliminating a competition that would be taken advantage of by unscrupulous Chinese officials and financial adventurers to plunge the country deeper into the mire of insolvency. On another page of this number of THE FAR EASTERN REVIEW will be found the speech of Sir Charles Addis on the work of the consortium together with his conclusions that if it should fail to function, its dissolution would revive the spheres of influence with the intensification of international rivalries and jealousies which marked the period of 1898-99, knowh as the "Battle of Concessions." If we admit that the treaties arising out of the Washington conference are to have any binding force, it is difficult to subscribe to these conclusions. With the recognition of China's full sovereignty, the spheres of influence have been abandoned and cannot be readily revived, whether the consortium functions or not.

In presenting arguments in favor of the consortium, Sir Charles has unnecessarily emphasized a possibility, that in the very nature of things, has vanished from the Far Eastern political stage. The one tie binding the international banking groups together at this time must be one of mutual assistance in financing China, in order to eliminate wild-cat loans and so prevent complete financial chaos, intervention, and international control of Chinese revenues for the service of past loans.

Sir Charles also advocates the practicability of negotiating with an autonomous or group of autonomous provinces for the construction of specific railway undertakings within their respective borders, and in doing so reverts to the plan proposed by the writer as the basis of Sun Yat-sen's national railway corporation in 1912. In the January, 1915, number of THE FAR EASTERN REVIEW, under the title of "The Status of the Chinese National Railway Corporation," the plan of financing Chinese railways through loans secured on provincial revenues guaranteed by the central government, was fully outlined. At that time, at the very inception of the republic, it was assumed that the new order would embrace a recognition of provincial rights in railway construction, and, that owing to the inability of the central government to allocate specific revenues for the security of such loans, the financiers could fall back on provincial revenues, with the added guaranty of the general revenues and good faith of the central government. It was assumed that the republican government would be organized on a basis of municipal and provincial autonomy with jurisdiction over public works and improvements within their boundaries, and that railway work could proceed without reference to the Peking government, except wherever such lines became inter-provincial, when control over rates and traffic would come under the central authority. Such a plan, harmonizing with the political tendency of the times, was, however, after most careful study, rejected by Dr. Sun Yat-sen and his advisers as involving insuperable difficulties arising out of independent negotiations with the various provincial authorities. Dr. Sun knew China and the limitations of his so-called republican governors and provincial parliaments, and realized that their ideas of autonomous rule had not reached that stage of enlightenment where such negotiations could be carried on successfully without resorting to bribery in its most obnoxious forms. Here, then, at the very outset of the new republic, its founders clearly recognized that railway negotiations, to be successful, would have to be centralized under some responsible bureau representing the federal government. At that period, there was some reason to hope that a constitutional central or federal government based on provincial autonomy would emerge from the uncertainty then prevailing. Ten years have passed. Chaos reigns in all the provinces. They are autonomous to the extent that they are dominated by military chieftains who acknowledge no allegiance to any central authority. To negotiate with any one of them separately in the matter of railways within their jurisdiction, would not only inaugurate a new era of unbridled graft, but make difficult re-establishment of the central authority.

Aside, however, from this aspect of the railway problem, the consortium faces a more delicate and serious political question in placing such a plan into operation. The groups composing the consortium cannot dissociate themselves from their respective foreign offices. The present consortium is the instrument of their governments, called into being at the special invitation of the American government, and hammered into an effective organization, through determined diplomatic support. The consortium is, therefore, political in every sense of the word, as much a part of the diplomatic machinery of the four powers whose support permits it to exist, as the embassies and legations through whom all matters are referred to the home authorities.

If the consortium, at this juncture, should initiate direct negotiations with any of the so-called autonomous provincial governments for the construction of railways, would not this constitute a formal recognition of such governments? Can the consortium initiate negotiations with Canton without conferring on that government some sort of official recognition of its status? As with Canton, so with any other of the independent or semi-independent *tuchuns*. Official recognition on the part of the foreign governments to Canton or any other so-called autonomous provincial government through their financial instrument, the consortium, would, under existing circumstances, tend to further complicate the situation, as all such negotiations must, in the end, receive the sanction of some recognized central government in order to safeguard the bondholders.

It is not difficult to sense that in advancing this argument Sir Charles had in mind the immediate resumption of work on the Canton-Hankow line, which, pending unification of the north and south, must involve negotiations with the Canton government. The Hukwang agreement covering the financing and construction of this important trunk line, provides only for the section between Wuchang and the Kwangtung border. For the line to be profitable and operated successfully, the Chinese section from the Kwangtung border to Canton (known as the Kwangtung Yueh-Han railway), would have to be taken over by the central government and brought under the consortium agreement. Here, we have a typical case of the difficulties surrounding railway finance in China. That portion of the Canton-Hankow line embraced in the Hukwang agreement and now pooled in the new consortium, must depend upon the privately controlled Chinese section in Kwangtung to reach a deep-water terminus at Canton or Hongkong, and, unless the latter be absorbed so that the entire railway can come under one management, the main section will always be at the mercy of the other. Any negotiations for a new loan to proceed with the uncompleted sections in Hunan embraced in the Hukwang agreement, must of a necessity, cover the taking over of the Chinese controlled Yueh-Han line, and here, pending unification of the country, the consortium must perforce deal with the Canton government.

This, undoubtedly, is what Sir Charles had in mind in advocating the opening of negotiations with autonomous or a group of autonomous provincial governments. In this instance, there is some force to the argument, as under any circumstances, the Yueh-Han line stands as a provincial property, independent of the ministry of communications at Peking, and if any agreement can be reached with the provincial company that would permit the consortium to take over the property and complete the section between Yintak and the Hunan border, it would assure the successful and profitable operation of the through trunk line whenever it is completed. It means, in effect, purchasing the property from the provincial company and holding it in trust for the Chinese people until such time as it can be incorporated in a larger loan with a stable central government for the completion of the other sections. While perhaps not involving recognition of the southern republic, it does emphatically involve recognition of the Kwangtung provincial government, a most essential part of the southern republic. Recognition of one would seem to imply recognition of the other, though perhaps international lawyers might find some precedent for negotiating with the autonomous province without compromising the consortium into recognizing the southern republic.

The arguments advanced by Sir Charles, indicate that the consortium is having a difficult time in breaking through the many obstacles that lie in the path of its success. As the head of the British group, Sir Charles is naturally interested in any plan that will hasten the completion of the Canton-Hankow line, while the other groups are equally interested in seeing some of their own pet projects realized. Although working in complete harmony, the various groups in the consortium have their own ideas of what work is most important to be carried out without delay. The American group has a natural preference towards starting work on the Hankow-Szechuan line and the Grand Canal, while the Japanese would like to see the extensions of the Shantung line taken up as soon as possible. Here, we strike other snags in the smooth working of the consortium, as we find that the two lines in Shantung surrendered to the consortium by the Japanese group are handicapped at the outset by a loan of $20,000,000 advanced by Japanese bankers to the Peking government on the security of these lines. These funds were dissipated by the Peking government in internal warfare, so the lines must now be saddled with this extra cost at the outset of any final negotiations, thus diminishing legitimate returns from the larger investment necessary to build them. If the main Shantung line had been handed over to the consortium instead of being returned to the Chinese government, these extensions could have formed part of the main system and the extra financial load of $20,000,000 more evenly distributed. Forming part of the Shantung Railway, under one management, the loan for building the two extensions would have materially increased the capitalization of the main line, without any undue strain on the earning capacity of the system. In this question, the Japanese lost a most valuable point at Washington, and at the same time, made the task of the consortium more difficult. As it is, the Chinese get possession of the main line of the system, while the important branches pooled in the consortium must stand on their own bottom and carry the interest load of a $20,000,000 advance, in addition to their actual cost of construction. Under these conditions, the financing of these extensions under the consortium may encounter difficulties, not only in negotiating a final contract with the Chinese government but ~~in~~ issuing the bonds afterwards. Much will depend upon the terms China is willing to agree to, and the extra burden may call for special terms if the lines are ever constructed.

On the other hand, Americans, especially the American International Corporation holding the Siems-Carey contracts, are interested in pushing through the Hankow-Szechuan line and starting work on the Grand Canal. These contracts stand on their own bottom, with such terms as should permit the loans to be raised at any time the bond market is favorable. On all the old railway contracts pooled in the consortium, the loan terms and conditions must be revised in order to enable the floating of a new issue. Here, sooner or later, the consortium must come to the Chinese and open negotiations. The terms of the Siems-Carey contracts, however, with their twenty per cent. participation in the profits of operation, eight or ten per cent. construction profits, five points commission to the bankers, and five per cent. on the purchase of materials, with chief engineer, auditor and traffic manager to assure the proper expenditure of the loan funds and direction of operation, should be ample enough to assure the success of a loan with which to proceed with construction. The same pertains to the financing of the Grand Canal. The Japanese partners in that scheme are favorably disposed towards raising their share of any loan for immediate resumption of work, but the New York market appears to fight shy of Chinese bonds.

Even in the matter of the Hankow-Szechuan lines, a clash of interests must arise whenever the time arrives for issuing a loan for its construction. It will be recalled that the original four power consortium (in which the old American group was a partner), holds the Hukwang Railway contract which embraces the line following the Yangtze from Hankow to Chengtu in Szechuan, and that the first section of this line from Ichang to the Szechuan border was designated for the American group to construct. Considerable progress has been made by the American engineers on this section, especially in the matter of surveys, and Mr. Randolph, the American engineer-in-chief, was appointed by the group as its technical representative during the negotiations leading up to the organization of the new consortium. The old consortium, therefore, is very much concerned over its rights to the line into Szechuan, and, whenever the time arrives to seriously consider financing this railway, either the Siems-Carey project or the earlier rights acquired by the four power group will have to be scrapped. One line must go, as the consortium, will hardly care to assume the difficult task of financing two lines into Szechuan at once. The American section embraced in the Hukwang agreement is the only railway contract the American group has placed in the consortium pot. The British group claim a prior right to construct the railway into Szechuan along the route surveyed by the Siems-Carey Company, thus reinforcing their American partners in the Hukwang agreement. The Hukwang agreement itself would be seriously impaired in value by the elimination of the right to build the Szechuan line, where the French also are to construct a section. In the event the present consortium is ever dissolved, and the pooled contracts revert to their original holders, the Hukwang agreement would be shorn of much of its value if the line into Szechuan is surrendered in favor of the Siems-Carey survey, and at the same time, it would eliminate the old American group from any share in prospective railway building in favor of the American International Corporation.

So, no matter where it turns, the consortium path is beset with enough legitimate financial difficulties to discourage the most optimistic banker. Add to this, the absence of any government in China that can provide the necessary guarantees to a loan contract of any nature, and the situation facing the consortium seems hopeless indeed. In effect, the real value of the consortium at the present moment consists in keeping alive the spirit of international co-operation, and through the support of their respective governments, preventing Chinese officials from floating worthless loans through irresponsible bankers. The greatest danger confronting the consortium and China at this juncture, is that some independent banker whose prestige in the investment field at home would enable him to dispose of the bonds to the public, may enter into a loan agreement with Chinese officials. Such a loan would effectively kill Chinese credit and make extremely difficult any subsequent effort on the part of the consortium to restore confidence. All the available and surplus revenues of the country are already pledged to the hilt. There is always the danger, however, that some unsophisticated banker may listen to the plausible stories of Chinese loan brokers, and accept without investigation a security that looks good on its face, and issue the bonds to his customers. This has been done before and can be put over again. But at this time, there is no excuse for pleading ignorance of conditions, and any banker that would accept without question the securities so offered, would be guilty of a crime.

If the present situation is left to work itself out, with the interest and principal on past loans being defaulted or postponed, the day cannot be long distant when China will have to face international intervention in the control of her finances, or, appeal to the consortium for help.

Because of the huge profits attached to such loans, the Chinese Bankers' Association may advance sufficient funds for the government to eke out a hand-to-mouth existence. On the other hand, there is no serious indication that they will come to front with the funds required to redeem the Shantung Railway, or do any signs exist that their patriotism will soar to the height of saving the Kiangsi line from falling under Japanese control for defaulting the interest payments. The financial outlook is therefore gloomy, with the consortium alone standing between China and disaster.

Should conditions ever warrant the dissolution of the consortium, the consequences can have little bearing upon China's political status. The Washington conference provides guarantees against territorial aggression for ten years at least, and in that time, the more sanguine friends of China believe that she will be well able to take care of herself. Drop the consortium and the consequences reduce themselves to a simple reversion of the pooled contracts and concessions to their respective holders. With all political and territorial phases of these concessions eliminated as a result of the recent treaties, they must be treated on their merits as business propositions. It goes without saying, that under these conditions, the Chinese government will never submit to being coerced into signing a final agreement for the execution of such concessions, as may have been extracted in the past through severe diplomatic pressure. Under this category would come some of the British and French concessions, as well as the Shantung extensions, originally forced from China by Germany, inherited by Japan and handed over to the consortium. The failure of the consortium therefore would simply deprive its pooled concessions of all commercial value. It is folly to assume at this date, that any government would invite world-wide criticism in supporting these concessions by means other than peaceful diplomatic correspondence.

The real danger from a dissolution of the consortium would arise from a renewal of the jealousies and rivalries incidental upon the opening of the field to independent wild-cat finance. Experience teaches us that the average Chinese official with no knowledge of previous committments, or caring less, if he did know, would unhesitatingly enter into new contracts infringing rights previously bartered away, for the sole purpose of obtaining as much bargain money as possible, or, for the more common Chinese object of creating international friction. Here we have a real menace which must be guarded against in the future. Such tactics on the part of Chinese officials encouraged by irresponsible foreign advisers created the situation that compelled the creation of the present consortium as the only way out of a dangerous tangle. The crude attempt in 1916 to force the United States into a show-down with all the allies on the "open door" doctrine at a time when they were fighting for their existence, ended by effectively closing the Chinese railway field to American capital, and compelling the formation of a new consortium as the only way Americans could enter the field at all. What happened before, can happen again if the field is thrown open to independent and irresponsible exploitation by the failure of the consortium. This is the real danger.

There is one more angle to a possible dissolution of the consortium, that should be of special interest to Americans. Drop the consortium, and under the Washington treaties, the Chinese investment field is automatically opened to all. But will American capital take advantage of this opening? We doubt it. The one feature of the consortium that appeals most strongly to American bankers is the international guarantee that the investments will receive adequate diplomatic support. It is the one strong selling argument that assures public subscription to the bonds. The American bond-holder has learned that he cannot always rely on his government for other than ordinary diplomatic support for the protection of his foreign investments. As a consequence, he is remarkably timid in purchasing the bonds of any country whose interior political conditions are chronically unstable. He knows for a certainty that public opinion will never support his government in employing the persuasive measures of other powers in the event of a default of interest or principal. A long-term American loan to China, at this juncture, without a guarantee of something more tangible than the support of the state department would be most difficult to float in America. The four-power guaranty attached to a consortium loan, however, raises a Chinese bond to the ranks of a gilt-edged security.

It is for these reasons that the success and continuation of the consortium must appeal strongly to Americans. If we admit that public opinion at home will refuse to support the American government in employing force for the collection of repudiated or defaulted foreign securities, long-term loans to China for some years to come, will be possible only through the medium of the consortium, the one safe guaranty to the bondholder that his investment will be protected.

With the disappearance of spheres of influence and all danger of territorial aggression through railway and other concessions eliminated as a result of the Washington conference, and the creation of a board of reference to make the "open door" a practical rather than a theoretical doctrine, there remains another important consideration that must be faced should the consortium be dissolved. With the menace of territorial aggression removed, the Chinese might be willing to grant concessions to foreign capital along lines that have proved so successful in developing other backward countries. Sooner or later, under new political conditions, a stabilized China must effect a radical modification of its ideas on concessions if foreign capital is to develop the resources of the country on terms that will assure profitable returns over a period of years. The concession is only another name for a franchise, which, in various forms, has attracted foreign capital into Latin American countries without in any way impairing their sovereignty. Once China is united under a stable government at Peking or elesewhere, it would seem that the results of the Washington conference will create a loop-hole through which the Chinese may avoid dealing with the consortium by granting concessions for the development of their public utilities, which the governments behind the consortium groups would find most difficult to oppose. In the competition for development loans, China may be compelled to accept the commercial concession granting rights of full ownership and operation over a period of years to foreigners, in order to attract capital. Americans might fight shy of such propositions because of the uncertainties surrounding the internal political situation during the next decade, but would all other nations be as cautious ? The scramble for concessions, should the Chinese adopt such a policy, would tax the powers of a board of reference to maintain the "open door" for all. It goes without saying, that concession terms that might be satisfactory to capitalists of one nation, would be rejected by the more cautious American investor, or, *vice versâ*.

It is also clear that jurisdiction over many of the most profitable public utilities must remain under the municipalities and provinces, absolutely free from interference on the part of the central government, a circumstance that would tend to materially complicate the Chinese investment field, and open up a scramble for concessions in which the most valuable would undoubtedly be snapped up by wild-cat promotors. A "Battle of Concessions," such as markered the period between 1898 and 1900, might well result from this condition, and create intense international rivalries and jealousies, such as are prophecied by Sir Charles Addis, but we fail to see how this would in any way affect the political situation after the very precise understandings arrived at in the Washington treaties. The value of the consortium under such conditions would seem to be in acting as a stopper to the issuance of such loans, through the concerted action of its component banks, correspondents and the brokers forming part of their bond-selling organizations. This means that it would have to constitute itself into a financial monopoly in fact, one that because of the pre-eminent position of its groups in their various countries, would enable it to exert sufficient pressure upon outsiders as to nullify their attempt to issue these independent Chinese loans on their respective markets.

These arguments seem to exhaust the case for the consortium, and we can now turn to a partial analysis of why it has failed to win the confidence of the Chinese, for which there must exist excellent reasons other than those put forward to explain the reluctance of the Chinese to recognize it. The consortium incurred the suspicion of the Chinese from the outset. The Chinese made an honest and earnest effort at Paris to pave the way for the success of the new combination, but were thwarted by the views of state department officials directing the negotiations.

At that time, the writer acted as secretary to the Chinese technical commission headed by Mr. Yeh Kung-cho, then in Paris for the purpose of keeping in touch with the organization of the consortium in order that its work might be facilitated and its plans accepted by the Chinese government who recognized the need of proceeding without delay to the construction of much needed trunk railways. I have refrained from making public the Chinese side of the case, but as many books and magazine articles bearing on the Paris conference have been written by others, I can be excused for throwing additional light on these controversial matters.

As I seek no favors from either the Chinese government or the consortium, I can speak freely without being misunderstood or misinterpreted, my sole object being to throw light on an administration, which, to quote the words of Elihu Root, was "incompetent to originate any policy for itself or carry one out if drafted for it by others." The facts herein disclosed will, at this late date, convey to friends in the Japanese, British and French foreign offices, and group financiers in Tokyo, London and Paris, that I faithfully endeavored to carry out a program for mutual co-operation, which met with their heartiest approval and support, at a time of great international stress.

The task of calling an international convention to straighten out the Far Eastern muddle, which the past administration compromised itself on four different occasions to perform, has devolved upon President Harding, Secretary Hughes, and other far-seeing statesmen. Saved from the possibility of war with Japan, the American people are now looking forward to an era of peace, harmony and co-operation in the Pacific, with China's territorial integrity strengthened and safeguarded by a series of treaties to which all interested powers have subscribed. There is one task, however, started by the last administration which remains unfinished. Wilson, Lansing and Reinsch created the consortium. It is left for Harding, Hughes and Schurman to make it work. Perhaps the information outlined in the following pages, will help clear the way towards a solution to this problem.

G. B. R.

# The Background of the Consortium

## China's Repeated Efforts to Break Down the Spheres of Influence and Solve her Problems in Her Own Way Thwarted by the Wilson Administration

### A PERSONAL NARRATIVE

*By George Bronson Rea*

IN 1912, Dr. Sun Yat-sen received full powers under a presidential mandate signed by Yuan Shih-kai, to organize a national railway corporation, design a national system of railways and negotiate with foreign bankers for their financing and construction. I was invited by Dr. Sun to accept the position of technical secretary to this corporation, and, after assisting him in designing a practical scheme of 10,000 miles of necessary trunk lines, was commissioned to proceed abroad as deputy director general with full power of attorney to initiate negotiations for its financing, preferably under some international financial combination that would take the railways out of politics and eliminate spheres of interest. On arrival in London, in January 1913, the scheme was presented to Sir Charles Addis, head of the British group in the consortium, whose response was that he would take over and finance every mile of railway Dr. Sun had to offer. He arranged a meeting with the engineers of the British and Chinese corporation at which the details were to be discussed. At that time, owing to the intergroup agreement, in made no difference which of the groups signed the preliminary agreement, as all Chinese business was shared equally. Notwithstanding this, at the solicitation of Mr. Willard Straight, then representing the American group, I decided to give Americans the prestige of signing the preliminary agreement, in order that our own group would have something tangible in the general consortium pot, and assure to American manufacturers a market for railway supplies. Postponing further talks with the British group I sailed for New York, arriving there in the latter part of February, 1913, about ten days before the change in administrations. The American group would do nothing until the policy of President Wilson on these matters was made clear. This he did in no uncertain manner within two weeks after assuming office.

Repeated appeals to support the American group in the construction of necessary railways, in combination with the other groups in the old consortium, proved futile, Secretary Bryan declaring that he could not endorse a Wall Street monopoly and recommending that I take the proposition to bankers in Denver, St. Paul, St. Louis, Chicago and other thriving Western cities, who, he declared, would be most anxious to take over any large Chinese loan. The situation was hopeless. With the American group outside the consortium, it became impossible to adhere to the original plan of financing the scheme as a whole with an international group and so eliminate the spheres of interest. Despairing of moving the president or the secretary of state from their position, it became necessary to break the scheme into individual contracts, and again, in order to assure full American participation in the development of China, I proposed to Mr. Straight that the American group take over a preliminary agreement for what was called the South-western Trunk System of over 3,000 miles, at that time free from international complications. No advance payments were asked or required. All the American group had to do, was to sign a preliminary agreement and place it in "cold storage" against such time as conditions would enable it to be financed. Even this was rejected, the bankers declaring they would have absolutely nothing to do with China, until such time as the president modified his attitude and requested them to re-enter the field. This was the last opportunity presented to American capital to participate in China's railway development with contracts absolutely free from international political complications. In his zeal to humble Wall Street and pave the way for his federal reserve system, President Wilson, not only closed the door to American development of Chinese railways, but prevented China from eliminating the spheres of interest in her own way and on her own initiative through international co-operation.

Thoroughly discouraged, I proceeded to Europe and unable to resume negotiations with the British group, split the scheme into individual contracts offering them to various world-known contractors in London and Paris. The Pauling contract for the Canton-Chungking line was arranged for, with four other contracts aggregating 4,000 miles of lines under way on the same terms, when the second revolution broke and Dr. Sun's powers were annulled. Returning to China, and explaining the situation to the government at Peking, I was requested to design another national railway system more in harmony with the ideas of the northern authorities for strategic control of the country. This program was then adopted as the basis of a new scheme for eliminating spheres of influence through international finance. I was appointed technical secretary to the ministry of communications and with Dr. Chen Chin-tao, as financial commissioner to conduct the detailed negotiations, authorized to proceed to Europe and organize a new international company for the financing, construction and equipment of the new scheme of 10,000 miles. This plan brought into the field the most reputable and experienced firms of railway constructors as principals to the contract. This international construction company was rapidly organized and a meeting held in Paris on April 22, 1914. The bankers, constructors and manufacturers of the United States, France, Britain and Germany participated equally in the organization of the company, which was to be registered in Switzerland. The greatest European financial institutions stood ready to finance the loans, (aggregating $500,000,000) to carry the scheme into effect. Chinese bankers received the right to share in the underwriting, act as depositories of the loan funds, and participate in the construction profits. The terms agreed upon, 13 per cent. on the financing and cost of construction, were two and a half per cent. less than those allowed by the American government for the financing and construction of the Philippine railways. It was for all practical purposes a new construction consortium called into being, by the Chinese government, to finance and construct a limited scheme of 10,000 miles of new railways, in which Chinese banks were permitted to share in the underwriting profits and Chinese capital brought into the construction companies, with an approximate participation of twenty five per cent. in the shares and profits.

The American participant, Messrs. J. G. White & Company, were not represented at the meeting, and it was voted to hold open their quarter-share in the enterprise until such time as they could guarantee the raising of their proportion ($125,000,000) of the loans. The British, French and German constructors had made all necessary arrangements for their groups to finance their obligations before accepting the offer of the Chinese government. In the meantime, the American company approached the state department to ascertain its attitude towards the scheme. The following official letter signed by Mr. Robert Lansing speaks for itself :—

DEPARTMENT OF STATE WASHINGTON

May 16, 1914.

Messrs. J. G. White & Company
43-49 Exchange Place
New York

Sirs,

I have to acknowledge the receipt of your letter of May 9, 1914, enclosing a copy of letter addressed by the President of your company to Dr. Chen Chin-tao.

In reply to your enquiry as to the attitude which this Government would take towards an enterprise of the character proposed by Dr. Chen, that is to say the organization of an international construction for the financing, construction and equipment of future government railways in China, I have to state that the information furnished the Department seems to indicate an intention on the part of the Chinese Government to grant the proposed company a monopoly of railway construction in China. If this understanding be correct, the proposed plan would appear to be in violation of treaty provisions which forbid the establishment of monopolies.

The Department is earnestly desirous of promoting the extension of American trade in foreign countries by all proper means, but cannot give its support to any enterprise which implies an exclusive right upon the part of any one company or group of companies to build and equip railways in any part of the world.

I am, Sirs,

Your obedient servant,

For the Secretary of State,

Robert Lansing,

Counselor.

It is true that the British government also withheld approval until the scheme was officially submitted for its scrutiny. On receipt of this remarkable communication, I hurried to explain that the company had been called into existence by the Chinese government, for the express purpose of internationalizing the railways and eliminating spheres of interest, and, that a contract for 10,000 miles was well within the right of the Chinese government to enter into, as because of its size, assuring a long period of activity for the bankers and constructors, it enabled China to obtain the lowest possible terms. This communication was never acknowledged. However, I was surprised to learn later on, that another state department official informed the representatives of J. G. White & Company, that it was not so much a question of monopoly that bothered the department, as the fact that joining with other nations in the construction of Chinese railways, would involve many difficult international problems which the American government would wish to avoid as far as possible. This seemed to indicate that motives other than those appearing on the surface, were responsible for this remarkable attitude. However, it is only necessary to emphasize at this point, that what was qualified as highly illegal and in violation of the treaties in 1914 when initiated by the Chinese government, became a most praiseworthy and legitimate international policy in 1918, after the situation had become so confused that international co-operation through a new consortium became absolutely essential to avoid more serious complications.

On learning the above facts, the Chinese government in July, 1914, ordered a temporary suspension of the negotiations. They were never officially cancelled, and the European participants, after consulting their legal advisers, took the position that their rights in any future reopening of the matter had been firmly estalished. The war intervened, but the rights of the company remained. On my return to China, the high Chinese officials concerned fully concurred in my views, and it was understood that the scheme should be held in abeyance pending a favorable opportunity to resurrect it. That opportunity never arrived, as Minister Reinsch, anxious to do something practical, personally intervened by proceeding to New York the following year to encourage the formation of a new American combination headed by the Siems-Carey Company to enter the field. When the details of the Siems-Carey contracts finally leaked out in Peking, I realized that a great blunder had been made, one which would result in foreign opposition, diplomatic protests and a closing of the field to American capital. The mere fact that the issue of the open door had been raised with the four allies at the same time while they were struggling for their existence in Europe, gave the contract all the ear-marks of an attempt to create friction between America and the Allies, and so redound to the diplomatic advantage of Germany. I reasoned with the contractors, and told them the lines specified would never be built. I placed the facts before Minister Reinsch and was informed by him that "everything had been most carefully considered in advance." When two months later, on the publication of the terms of the final agreement signed on September 27, 1916, the state department declared that it had no official knowledge of the contract, it placed the responsibility squarely up to Peking, and indicated that Minister Reinsch had concealed the facts for four months from the state department in order that the government would have to face the issue. I saw that it would be impossible to support such activities, and as my usefullness with the Chinese in solving their railway problems had been terminated, I determined to leave China and concentrate my efforts towards bringing about international co-operation to avoid more serious complications. The protests of the Russian, Japanese, British (and the subsequent attitude of the French towards the Siems-Carey contracts) told me that the only way left open for American capital to enter China, during the period of the war, was through co-operation with other powers.

I explained my ideas carefully to Sir Bielby Alston, British Chargé, at Peking and to my Chinese friends, who approved of them, and then visited Tokyo to ascertain the attitude of the Japanese government towards such co-operation. Here I was informed by Baron Motono, through Mr. Inouye (now governor of the Bank of Japan), that as Japan held special political and other interests in Manchuria, the Japanese government could not approve of any international scheme, which, although proposed in the utmost good-faith, might conceal a revival of the Knox neutralization plan. They recognized, however, that they had no special rights or position in China proper, and would not oppose any plan for American co-operation in concessions held by their allies, in fact, they thought that cooperation at such a time would strengthen the morale of the Allies. The Japanese, on the other hand, welcomed American co-operation in the development of Manchuria in order that the two nations might work in harmony in this sphere and dispel all causes for misunderstandings.

I then proceeded across Siberia and after an interview with the officials of the Russian foreign office on their position in Mongolia, arrived in due time in London, and later in Paris. In both capitals I fully explained my ideas on co-operation to the leading bankers interested in China and to the officials of the foreign offices. These views were received with great sympathy and approval with the expression of hope that American cooperation with Britain and France in China could be brought about as soon as possible in order to consolidate mutual interests and policies in that country. Both the British and French foreign office officials with whom I conversed, were deeply solicitous in those darkest days of the war, about the trend of American activities in China, which seemed to indicate an intention to raise issues at a time when neither country was in a position to properly defend its rights. Any plan of co-operation in China that would bring America into line with them, would receive their cordial support. With these assurances, I hastened to the United States, arriving two days after the declaration of war with Germany. I laid my plans and ideas before Secretary Lansing, and at the latter's request embodied them in a memorandum. This memorandum follows, and it will be seen that the plan therein outlined, subsequently served as the basis for the new consortium, but expanded in order to meet the new situation arising out of Japanese military activities in China.

For a better understanding of the following memorandum, I might state that when the Japanese presented the twenty one demands to the president of China in January, 1915, Mr. W. H. Donald, then editor of THE FAR EASTERN REVIEW, residing in Peking, was requested by the Chinese authorities to undertake the publicity campaign that would disclose to the world the full import and extent of this *demarche*, and it devolved upon myself to take charge of this work in America while Mr. Donald remained at Peking in direct touch with events. When China found that she had to accept Japan's ultimatum and sign the treaties, I received a lengthy telegram at Washington from Peking, requesting me to see the secretary of state and obtain his promise that the American government at the expiration of the war, either at the peace conference or a separate international convention to be called for that purpose would have the whole question of China brought before the world, in order that her case could be fully presented. Mr. Lansing, in effect, informed me that this was the policy of the administration and gave me permission to so inform Mr. Sha Kia-fu, the Chinese minister at Washington for the information of his government. Later on, in July of the following year when the Russo-Japanese alliance was announced ; in August of the same year, in connection with the further demands of Japan upon China arising of the Chenchiatun incident, and once more in October when the Siems-Carey contracts were protested by the powers, the state department publicly declared its intention to refrain from facing any Far Eastern issues, until the termination of the war, when, at the peace conference or at another special convention, the whole case of China would be taken up and her status defined for all time. With an intimate knowledge of these declarations always before me, I assumed that the administration really had a fixed policy, which explains that part of the memorandum advocating a *temporary* solution of China's problems pending their final adjustment at the peace conference.

## MEMORANDUM

### A TEMPORARY SOLUTION OF CHINA'S RAILWAY PROBLEMS

*Submitted to the Honorable Secretary of State, June 23rd, 1917.*

I beg to submit the following suggestions for a temporary solution of these problems, pending a final decision as to the status of China at the *post bellum* peace conference.

You are familiar with the details of the present international political tangle in China precipitated by the American railway contract which raised the issue of the "open door" with the four allies—Great Britain, France, Russia and Japan—at the same time, and you will sense the fact, that notwithstanding the unquestioned purity of motives on the part of the American company, the allies have good reason to suspect that the issue was raised for the purpose of complicating the international political situation. As the state department has publicly placed itself on record that for over four months, it had no official knowledge of the details of this contract, this throws the responsibility for raising the issue upon the officials of the American company.

Such being the case, it should be reasonably apparent that our allies will not be disposed to hold any great friendship for those who precipitated the issue, and, although they have to depend upon us for financial and other support at this time and are reluctant to criticize, it is logical to suppose that they will passively, at least, oppose any further muddling of the situation in China by the selection of other railway lines for Americans to finance and construct, until a disposition to find an amicable solution is mainfested.

The situation at present is that the American contractors having simultaneously raised the issue with the four allies, and having seen their original five lines protested and cancelled, are now negotiating with the Chinese to obtain in substitution and in conformity with the terms of their contract, other profitable lines for exploitation. Obviously, the only lines they will be permitted to select, are what the other powers designate as "buffer lines," or lines between spheres, beginning nowhere and ending nowhere, and whose acceptance by the Americans can only tend to further complicate the situation, by emphasizing the "Spheres of Influence," which, in the end, must embarrass the American government in defending its traditional policy of the "open door." In plain words, the American company will not be permitted to select profitable lines to supercede those that were protested, and, after the refusal of the American government to support the lines originally specified, the Chinese authorities will hardly dare to concede others which may result in further protests at this time.

The situation is further complicated by the fact that the American company has received terms which make it impossible for the European concession holders to finance their own contracts in America. Although the terms are equitable and the contractor is fully justified in asking for and obtaining every legitimate profit as a business proposition, a situation has been created which now calls for a complete revision of China's outstanding railway contracts, covering the construction of 10,000 miles of lines and involving foreign loans aggregating $700,000,000, and incidentally imposing an additional burden of many millions on the Chinese taxpayer. The only possible manner in which these new railways can now be financed lies in the extension of the American terms to all the other contracts, thus conceding terms to the Europeans, which will leave sufficient margin of profit to enable them to raise the funds in the American financial market. As the Chinese government is already compromised to concede the most favorable terms to new German and Japanese lines, the other interested powers, must, in self-defense, and when the time is opportune, demand the extension of the same terms to cover their own contracts.

The situation, then, is this: The American contract precipitated the issue of the "open door" with the four allies at the same time; Great Britain, France, Russia and Japan incline to the belief that it was a German trap, into which the Americans walked with their eyes open; the official European concession-holders cannot finance their contracts in America unless conceded the same terms as the Americans, or better; they are not willing that the American company be permitted to further complicate the situation by selecting other lines; the Chinese authorities will not dare specify other lines which traverse the so-called spheres of special interest; the allies are estopped from openly voicing disapproval at this critical time because of their dependence upon us for financial and moral support in the conduct of the war; they are naturally disinclined to seek or accept terms from any official financial combination, and would rather have the problem approached as a whole so that an amicable solution can be found, acceptable to all interested parties.

The European financiers must rely upon American co-operation to comply with their contracts in China, and to do this, must receive terms equal to the American contract to enable them to obtain this financial support upon a business basis. As long as no effort is made to find a common ground for co-operation, the interested powers can hardly be expected to surrender what they still consider as their special rights and privileges in their respective spheres, nor is it reasonable to suppose that they will permit the Chinese authorities to select further profitable railway concessions within these spheres for Americans to finance and construct until a satisfactory solution is found.

It must be remembered, that previous to the war, American bankers were unable to float loans in America for the development of Chinese enterprises; and, in various past transactions, the major portion of their participation in these bond issues has been subscribed to by the London and Paris markets. It should also be kept in mind that, rightly or wrongly, the British and French feel that the wealth that has rolled into our coffers since the outbreak of the war represents their life-blood, and that it is this wealth that now enables us to seek concessions in China. Relying on our high sense of honor and justice, they therefore cherish the hope that in any American scheme for co-operation in China, they should have the preference, and, while for obvious reasons, they may not openly voice their disapproval at this time (human nature being very much the same the world over) they must view with deep concern the recent arrangement of an American corporation in co-operating with Japan, while our financiers show no disposition to reach some amicable adjustment with themselves.

If the so-called "Spheres of Influence" in China are to be abolished and American capital permitted free scope to obtain valuable railway concessions in disputed territory, it would seem reasonable to suppose that the other powers will be loath to surrender their pretensions and rights at this time, unless some genuine spirit to co-operate with them is manifested by American financiers.

Exclusive of the American contract for financing and constructing 1,500 miles of railways, the Chinese government has compromised itself to the further construction of 10,000 miles of lines with the other powers, of which approximately 7,000 miles are under contract to British, French and Belgian interests, the loans for which have still to be raised when conditions permit. These 7,000 miles of railways will call for, under pre-war costs, approximately $400,000,000. It is manifestly impossible for this amount to be raised in Europe immediately after the war; and, if the lines are to be built at all, the financing will have to be spread over a period of from ten to fifteen years, calling for an annual installment of from $25,000,000 to $40,000,000 for investement in Chinese government railway bonds. This will probably be as much as the markets can absorb. This total might be materially reduced by the elimination of certain sections of the difficult Belgian lines and brought down to about $300,000,000 and spread over a period of ten years. It would be extremely difficult, if not impossible, to raise such a loan at one time for the development of Chinese railways; besides, it would be unnecessary. It is generally estimated that if a Chinese railway proposition is assured of $5,000,000 a year for construction and other expenses, work can be pushed ahead without any fear of financial difficulties.

This being the case, if we take three British, one French, and one Belgian contract to finance, these will call for an annual investment of $25,000,000 in Chinese government railway bonds for the next ten to twelve years, to see these five propositions through to completion. The question therefore arises; is it not better for the American government to use its good offices with its own financiers and persuade them to guarantee the annual investment of $25,000,000 for the next ten or twelve years in Chinese government railway bonds, so as to permit the British, French and Belgians to comply with their obligations in China? Is it not better to make this safe and conservative investment, rather than face the possibility of further serious complications arising out of these railway concessions in China? In other words, is it not best, for the higher interests of the nation, for the government to recognize the present situation and the drift of events and use its influence to have this sum invested as an insurance against possible war, and so amicably settle the Chinese railway problem in such a way that all can work harmoniously together, and take this ever-recurring irritant out of the scope of dangerous international politics? If a disposition be manifested at this time to co-operate with the others, is it not reasonable to suppose that there will be an immediate breakdown of the "Spheres of Influence," and American capital permitted a clear field in China for profitable railway investments?

It may be urged that this is solving the difficulty with the dollar and unbecoming our dignity as a nation, but against this we must recognize that conditions have changed and our bankers must now take over the financial load that London and Paris carried before the war, and reciprocate and co-operate with the others in China. This co-operation must come as a natural result of changed conditions, and no one combination of American capitalists should be permitted to preserve a financial monopoly in China and dictate the terms to the others in such a delicate international problem.

I have refrained from mentioning co-operation with Japan, taking the reasonable position that Japan has accumulated enough wealth out of the war, to enable her to finance her own undertakings in China. It seems unnecessary also to include Russia, for the reason that the only Russian railway concession in China is purely political and Russia is in no hurry to utilize it at this time, being content to keep it in "cold storage." Therefore, our immediate problem is to find a way to work in harmony with Great Britain, France and Belgium in China proper, and in contracts already entered into, and in which Japan has no direct interest, or reason for objection.

If, at the request of, or with the approval of the state department, a combination of American bankers, should guarantee an annual investment of $25,000,000 in Chinese government railway bonds for the next twelve years, at a reasonable rate of profit to themselves, and so permit our British, French and Belgian allies to carry out their contracts and obligations with the Chinese government and thus preserve their prestige in China, it seems clear, that, in addition to the regular banker's profits on the loans, the American manufacturers would also profit from the sale of materials, pending such time as the industrial establishments of the other countries can be reconstructed.

I feel sure that if the president or the secretary of state should approve such co-operation, the interested powers would at once modify their policies and consent to some broader interpretation of their special agreements with China which now restrict our independent action in the development of Chinese railways. Once there is a return of industrial activity in China, internal conditions will rapidly improve, the people will become more contented, and with employment and prosperity, there will be an end to these periodic domestic troubles which have their real origin in economic disturbances arising from the too acute struggle for existence in a densely populated agricultural country. If China is guaranteed fifteen years of respite from these international intrigues for railway concessions, and the harassed officials relieved of the constant diplomatic contest with other powers over these matters, it will enable the Chinese government to devote its whole time and attention to the reform of other pressing demestic problems, and thus make for stability, internal peace and ultimate strength.

It was this solution that I outlined to the British charge at Peking, and afterwards to the head of the Japanese official banking group (Mr. Inouye, president of the Yokohama Specie Bank) and to the officials of the British foreign office, and M. de Margery in Paris, and which received their endorsement in principle, with an expression of hope on the part of the British and French that this co-operation could be arranged before the expiration of the war, as obviously such co-operation at this time would tend to bind our mutual interests in China more strongly together. The Japanese financial interests after consultation with their foreign office informed me that they could have no objection to any co-operation between American financiers and British and French interests in parts of China outside of Manchuria and Inner Mongolia, where Japan considered she had a special political and commercial position. If such co-operation with British and French interests is not forthcoming, if no attempt is made at this time to solve the problem, how can the people of the United States expect that the governments of Great Britain, and France will wholeheartedly support our present policy in China?

Naturally, if a solution is to be sought, the first move must be made at this end, and a basis found upon which American bankers will consent to raise the annual allottment of $25,000,000 for investment in Chinese railway bonds. This is not a question of issue price or interest, but simply the amount of underwriting profit the bankers will require to handle the bonds. The interest and issue price, especially the latter will be governed by market conditions at the time the various installments of the loans are issued and, after approval by the Chinese government. Once the profit desired by American bankers is determined, and a reasonable profit on the construction of the lines and the purchase of materials is provided for the European concessions holders, the plan must be taken to Peking, and presented to the Chinese parliament, so that they can have the final voice in the revision of the old contracts and decide upon suitable terms for the British, French, Belgian, Japanese and Russian contracts. It being understood that by reason of their special understandings with the Chinese government, the Japanese automatically receive the benefit of the most favorable terms to cover their engagements.

The first step must then be made in the United States, and in my judgement, it is a matter of such extreme importance to the future of American prestige in China, that the arrangements should not be left entirely to financial interests, whose energies are now concentrated on finding lines on which they can start work and issue their own bonds before other loans are placed on the market. It is decidedly a matter in which, for the preservation of American prestige in China, and the best interests of all concerned, the state department is called upon to take action and lead the way, in order to avoid further misinterpretation of our policies.

I make the above statement advisedly, for the reason that the only justification the Chinese have for reviving foreign participation in the profits of state railways is because they were led to believe the United States would protect the lines specified in the contract and defend the "open door" policy. A high Chinese official admitted to me that as the American minister had been instrumental in organizing the new American combination and acted as its sponsor, the Chinese authorities had every good reason to assume that the minister acted under instructions from his government, and the United States would now defend the "open door" policy. It was for this reason, and this alone, that the Chinese were willing to *pay the price* in the terms conceded the Americans, terms which overturned and surrendred the one policy they had consistently adhered to for the past twenty years. To anyone conversant with Chinese politics, it is clear that no official would dare to take upon his own shoulders, without reference to parliament or the wishes of the people, the responsibility of again reviving foreign participation in the profits of government owned railways (a privilege that must now be extended to all) unless he could justify himself before the nation by obtaining some greater compensating benefit. The life of any official who would surrender the vital interests of the nation without receiving some greater advantage for the people would not be worth an hour's purchase.

The cherished state policy has been surrendered, and the terms conceded to Americans must now be extended to all other nations. The Chinese have *paid the price*, but Americans have failed to deliver the goods. Is it fair or honorable for the government of the United States to permit an American company to pocket the price, force the complete revision of all China's railway contracts and open the door for all nations to participate again in the profits and management of China's railways, without the Chinese receiving in return what they paid for, or without the Chinese people being permitted a voice in designing a new railway program ? Is it fair or honorable under these circumstances, for the United States government to remain inactive while such a contract is pushed through by an irresponsible official without the people, through their parliament, having a voice in the revision of their railway contracts ? If this contract is permitted to go through without reference to the Chinese parliament and the terms extended to all other contracts, and the people are saddled with additional burdens as a consequence, may it not precipitate another revolution, reacting upon all Americans in China ? Is the state department willing at this time to permit a situation to endure, which can only result in disastrous consequences to American prestige in China ? Are we, at this critical time, willing to permit this situation to develop into a festering sore until the Chinese become inflamed at our indifference to their vital interests, and the progressive masses turn from us as they did in 1905 ?

For this reason, I contend that the matter is one in which the state department must take the initiative. The prestige of every American in China hinges on the attitude of the government in this matter.

I feel certain that if the state department will take action, the patriotism of our bankers will rise to the occasion, and a way found to assist our allies at this time and so stabilize the situation while preserving intact our traditional policy in China, and demonstrating the friendly interest of our government in China's complex problems.

If the secretary of state will even unofficially signify his approval of the principle underlying the suggestion of co-operation as a solution, the way can be found to take the matter up with the leading bankers of the country, and ascertain their views.

Respectfully
GEO. BRONSON REA.
452 Riverside Drive, New York City.

(I invite attention to the fact that the above memorandum was dated June 23rd, 1917. It pointed a solution to the Chinese railway problems, which the administration, over a year later, accepted, and, with certain modifications, placed into practice. A perusal of the state department's letter of July 9th, 1918, to the American bankers outlining the conditions of the new consortium, and the further memorandum of the department to the British, French and Japanese embassies dated October 8th, 1918, will indicate that the plan outlined in the above memorandum, was adhered to in all essential points, especially in that which recognizes the necessity for the United States to carry for the time being the British and French portions of loans to China. The one feature of the new consortium not provided for was the inclusion of Japan in the partnership and the sharing of our burden by the Japanese group for carrying the other two partners. In this one respect, the department, with its more intimate knowledge of international conditions, was able to round out a finished instrument for a permanent rather than a temporary solution of these problems. It is quite clear, however, that these principles were not accepted, until every other device and strategem was resorted to in order that American capital could break through the sphere of influence doctrine and operate independently in China. Minister Reinsch made a determined fight to carry through an impossible program, but in the end, both he and the department, had to accept the principle of co-operation as the only manner in which American capital could enter the railway construction field in China and eliminate for all time the spheres of special interest. Three times in five years the plans of others for achieving this purpose had been thwarted by the absence of an intelligent policy on the part of the Wilson administration, and only when all other methods proved unavailable did it accept the principle.

In a lengthy interview with the secretary of state, I was informed emphatically that the state department had been maintained in ignorance of the existence of the preliminary Siems-Carey railway contract signed in May, 1916, until the final terms of this contract were made public in Washington on October 1st of the same year. This strengthened my belief that American policy in China was being shaped in Peking without reference to Washington. Refusing to embarrass the administration at such a time with newspaper comments or criticisms, I entered the army. On the signing of the armistice, I resigned in order to accept the invitation of Mr. Yeh Kung-cho (China's minister of communications) to act as secretary to the technical commission attached to the Chinese peace delegation, and advise them on the international political complications surrounding their railway concessions and design a new pooling plan to be presented to the new consortium.

The Chinese technical commission, as well as their peace delegates, were sincerely anxious to meet the new consortium more than half-way, feeling that inasmuch as China needed financial assistance, much delay would be avoided and the dignity and sovereignty of their government upheld, if a suitable scheme for pooling their railways could be presented to the consortium as a basis for arriving at an amicable adjustment of the difficulties involved. They felt that much real progress would be made if the scheme finally accepted emanated from the Chinese government, instead of the consortium devising their own plan and forcing them to accept it. There is little doubt that had their views been considered at that time it would materially have contributed to an early success of the new financial combination, by eliminating all suspicion of its motives. The Chinese stood ready to welcome the consortium with open arms. Unfortunately, however, state department officials then in Paris, had very set ideas as to what they wanted.

I have refrained from making public the Chinese memorandum submitted to the consortium at Paris, which met with the approval of the technical commission and peace delegates as reflecting the desires of their government in readjusting its railway contracts. It was assumed at the outset of the peace conference, in fact, up to the very hour of the Kiaochow decision, that principles so loudly proclaimed during the war would be lived up to. It was assumed that henceforth all political considerations would be eliminated from these railway concessions and they could be approached as simple business propositions. Furthermore, in view of the changed financial conditions and impossibility of carrying the old contracts into execution under the terms prescribed in the loan agreements, it seemed logical to assume that the Chinese government would be permitted to exercise its sovereign power and conceded the choice of one or two procedures. It could demand their cancellation, or, it could do the fair thing and reimburse the bankers for out-of-pocket expenses, or, it could go even further and pay them half the prospective profits in order to regain complete jurisdiction over its future transportation system. With this in view, a rough reorganization plan was drafted, but the idea of purchasing concessions did not appeal to the Chinese, who, at that time, were buoyed up by the hope that President Wilson's ideals would prevail and their sovereign rights recognized under the league of nations. The Kiaochow decision shattered this dream. After careful study the plan was revised to meet this objection.

This plan was submitted to the groups, in the hope that China's wishes might be given consideration at the very outset of the negotiations, and so strengthen the position of its government and relieve it of the implied indignity of having terms forced upon it. It was felt that under the new world dispensation, some practical application would be given to the President's fourteen points and China placed in a position to assert her sovereignty. As most of China's railway concessions were extracted under severe diplomatic pressure, it was felt that under changed conditions, China would have the right to cancel them. If increased terms were to be granted, China was entitled to designate the new national railways for opening up the country. In other words, if the principles heralded far and wide during the war by spokesmen for the allied powers were to be applied, then, China as a sovereign state under the League of Nations, held the whip-hand over her future railway development. If a contract is a contract, then all these old railways would have to be built under the terms agreed upon. If not, and China was approached for new and increased terms, then she would be able to refuse, or exact reciprocatory advantages.

The Chinese position was set forth in the following memorandum:

### SUGGESTED PLAN FOR THE POOLING OF CHINESE RAILWAY CONTRACTS UNDER THE NEW CONSORTIUM, FOR THE PURPOSE OF ELIMINATING SPHERES OF INFLUENCE AND RESTORING CHINA'S SOVEREIGNTY OVER FUTURE RAILWAY CONSTRUCTION.

WHEREAS; the Chinese government has in the past been prohibited from developing a comprehensive and co-ordinated system of state railways, because of the pressure brought to bear by foreign governments for the acquisition of special railway rights and concessions, in which the lines bear no relation to the legitimate transportation needs of China, in fact, in many instances designed to divert or attract the trade of China to adjacent territories or to international treaty ports outside the jurisdiction of the Chinese government, or to delimit or develop so-called spheres of political or commercial influence, and

WHEREAS; this policy has tended to obstruct and delay the proper development of the natural resources and domestic and foreign trade of the country; and in addition, by circumscribing the sovereign rights of the Chinese government to link up the remote provinces with the capital, and so impeded the central government and its military and police forces from exercising their proper functions in maintaining internal peace and order essential to the stability of the central authority and to the peace, happiness and general welfare of the people, and

WHEREAS; a situation has now been created as a result of the war, whereby the holders of railway concessions and contracts are unable to carry out their obligations under the terms of their contracts with the Chinese government, because of the inadequacy of the financial terms and conditions, and

WHEREAS; it is highly important for the welfare of the Chinese people and the foreign nations interested in the trade and development of China to build new lines of communications opening up the country to commerce and thus resulting in mutual and reciprocal advantages, and

WHEREAS; the Chinese government recognizing the fact that financial conditions have now changed, and desiring to manifest once more that spirit of justice and equity that has always characterized its business dealings with foreign countries, is disposed, on its own initiative, and as a further proof of its good will and friendship, to grant certain revised financial terms and conditions that will permit the holders of Chinese government railway concessions and contracts to comply with their obligations; it is therefore suggested, that

(1) The Chinese government will cause to be designed under a mixed commission of expert foreign and Chinese engineers, a comprehensive system of new state or national railways, with a total mileage of 10,000 miles to correspond with the total mileage under contract with foreign interests. This national system will conform to the immediate transportation needs of the country and the requirements of the central government in preserving internal law and order, and will be confined to feasible and profitable lines. This approved scheme will then be made the program for construction until the lines are completed.

(2) All holders of railway concessions will surrender to the Chinese government (or to the consortium) all their rights and pretensions, on the condition that they will receive an equal mileage for construction under the new approved system and revised financial terms.

(3) Those who refuse to pool their interests in the new consortium, or who may be refused admission by the official groups, or, for any other reason, will be given due notice by the Chinese government to comply with their obligations within a specified time under the terms of their contracts, failing which, the Chinese government in the full exercise of its sovereign powers will declare their contracts null and void. The foreign governments to whom the concessionaires owe allegiance will abstain from entering any protest or exerting any pressure on the Chinese government to protect the contracts from being cancelled.

(4) In consideration of the new and revised terms to be conceded by the Chinese government for the carrying out of uncompleted railway contracts, the various foreign governments will abrogate and declare null and void all special railway agreements promises and rights that are in any way incompatible with the dignity and sovereignty of the Chinese government, or its full liberty of action in building railways within its jurisdictional borders. This refers to secret and other agreements entered into between the foreign governments and the government of China circumscribing the latter's authority or granting special privileges to the former; to the secret and other agreements entered into between the foreign governments or their official financial groups defining or delimiting their respective spheres of railway activities in China, and to such clauses in existing or completed railway loan agreements which operate against China building extensions or branch lines.

(5) On the restoration of full sovereign rights in the matter of future railway construction, which is otherwise provided for in the charter of the league of nations, the Chinese government will enter into a binding agreement with the foreign powers concerned, to refrain from granting further railway contracts or concessions for a stated period of years, or during the time necessary to finance and complete the approved national system. It is understood that Chinese capital will have complete liberty in financing and constructing feeders and branches to the main system, and to be permitted to participate in the construction of the main lines.

(6) The Chinese government will then enter into a contract with the international consortium as called into being by the invitation of the American government, or, with a special international railway financing and construction consortium as the case may be, for the financing and construction of the entire scheme of approved railways. In the proposed consortium, Chinese capital is to be conceded an equal participation in the shares and profits of the construction end.

(7) In view of the fact that the Chinese government has entered into contracts with various American and British interests for the building of railways on a fixed percentage of profits over the costs of financing and construction, and to equalize the conditions of all the contracts under the proposed revised terms, the contract for the approved national system will be of the type known as a percentage contract, in which the Chinese government will pay to the banking consortium, or, to the international financial and construction Company, a fixed percentage of profits over and above the actual costs of financing and construction.

Such a contract may follow the general lines of the similar agreement entered into between the American government and the Philippine Railway Company for the financing and construction of railways in the Philippines, where the company was allowed a fixed profit of fifteen and a half per cent., over the cost of financing and constructing the lines, or, the contracts between the Chinese government and Pauling & Company providing eleven and a half per cent. or that of the Sims-Carey contract, or, preferably, the conditions agreed upon in Paris in 1914 for the financing and construction of 10,000 miles of new railways under an international financing and construction company, in which the lines were to be built and financed for a total profit of thirteen per cent., including Chinese participation in the shares and profits of the construction end.

(8) All the railways contracted for under this scheme will be Chinese government owned and operated lines, built from the proceeds of Chinese government loans, secured by a first mortgage on the physical property and earnings of the lines, and guaranteed as to interest and principal by the general revenues and good faith of the Chinese government.

(9) The usual guarantees for the proper expenditure of the loan funds and the protection of the Chinese government and the bondholders will be given, such as the appointment of engineers, chartered accountants, traffic managers, etc., along the lines of the Pauling contract for the Shasi-Singyfu railway.

(10) To avoid international discord which may reasonably arise if an international organization be designated to construct and supervise any one trunk line, it is suggested that the lines in the general scheme be so apportioned amongst the members of the groups, that each national construction company shall have one complete line to construct and supply with materials. The specifications for the materials for all the lines will conform to a general Chinese government standard to be designed by an expert engineering commission.

(11) This will insure to the manufacturers of each country an equal division in the supply of materials, without having to compete with the manufacturers of all the others. It is entirely conceivable that for the next five years, or perhaps longer, the British and American manufacturers will be in the most favored position to compete for this business to the inevitable dissatisfaction of the French, Belgians or Japanese. It is also conceivable that under anything approaching normal conditions, in any general competition, the Belgian manufacturers would underbid those of other countries. In any attempt to divide the orders for materials on any one line, there is bound to be discord and confusion over the final adjustment. This is the reason why it seems most practical to divide the lines in the general scheme, so that each national construction organization will have full scope for putting into practice their engineering methods without coming into conflict with the others and of having their exclusive market for materials assured

(12) It is also suggested that as a means of facilitating construction and to avoid the losses in interest, etc., surrounding the tieing up of a large loan for any one particular line, and so utilizing to the full advantage the loans that may be annually raised for Chinese railway development, that the annual allottment of railway funds be so apportion that construction can proceed on five lines simultaneously. This will guarantee work and profits for all the national units of the international combination and bring about harmony and friendship, which cannot be accomplished under any other system.

(This suggestion is advanced because in the past, loans for the construction of a complete line have been floated at one time and lain in the banks for several years, or during the progress of construction. It is taken for granted that the average rate of railway construction in China will not exceed 200 miles on any one line annually. As it seems impracticable to attempt to construct a single railway under an international organization, due to the difference in practice and engineering methods, and the conflicts between the engineers and employees of different nationalities, it seems advisable to keep the different nationalities apart in actual construction. The best way would then be to start five lines at once, or sections of five different lines of 200 miles in length that can be financed by the annual allottment of loan funds. If we assume that the new consortium will be able to furnish loans to the extent of 50,000,000 dollars annually over a period of ten years for the purpose of completing the general scheme under contract, instead of floating the loans on the security of any one railway the security could be all the lines in the general scheme, and the revenues from these pooled for meeting the obligations of the loans. As the general revenues and good faith of the Chinese government guarantees the loan, it seems immaterial whether the loan is raised on the security of one particular line or a group of lines.

(13) In this manner each national participant in the new railway consortium will be able to proceed along lines with which their engineers are familiar without coming into conflict or contact with the others. In other words, the individual lines of the general scheme would be entrusted to one national company to construct and furnish with materials, but would be internationalized and brought under the direction of the consortium through the loan, and after the line is constructed and in operation, in the distribution of the executive posts in the supervision of maintenance, accounts and traffic.

*Paris, June* 5, 1915.

In effect, this memorandum assumes that the old railway contracts cannot be carried out on pre-war conditions, and the holders must approach the Chinese government for more favorable terms. China said to the consortium and the various governments concerned, "surrender your old contracts, extracted from us by diplomatic pressure in the past, in order that our sovereign rights over our transportation system be fully restored, and then, in gratitude for this simple act of justice, we will invite you to cooperate with us in designing a new national system of railways, and will enter into a contract with the consortium for its financing and construction over a period of years, during which time, we pledge our good faith not to sign any new contracts that may interfere with the successful flotation of the loans required to make your task successful."

In view of the mixed character of her railway agreements, and in order to consolidate all the old contracts under uniform terms, China selected the percentage type of contract along lines similar to the Pauling and Siems-Carey agreements and the American government contract for the Philippine railways which assures that the lines will be constructed economically, efficiently and expeditiously by responsible, reputable and experienced engineers. She furthermore explains that only under some such contract can her capitalists legitimately receive a fair share of the construction profits.

The Chinese proposition deserved better treatment than it received. I am able to state that their ideas were not out of harmony with those of the French and Japanese groups, and although I cannot make such a positive statement in regard to the British attitude, I have reason to believe that they would not be rejected, because of the fact, that the identical principles had been accepted in the international company of 1914, in which the British participant, Pauling & Company, was financed by Erlanger & Company, and the Hongkong & Shanghai Banking Corporation. The opposition to the Chinese proposal, as far as I could learn, emanated from officials of the state department, who reverted to their position of 1914 and denounced the plan as "their old monopoly."

There may have existed other good and excellent reasons to account for the American refusal to consider the Chinese side of the case, pending such time as the political phases of the consortium were clarified by the adherance of the various governments to its principles. It is also easily understandable that the consortium could not function until its internal organization was perfected, but nevertheless, I hold firmly to the belief that a great mistake was committed at the outset by completely ignoring the Chinese memorandum and characterizing their solution as a monopoly, at a time when they cherished the illusion that their sovereign rights were to be firmly established and recognized under the new order of things.

It goes without saying that Mr. Lamont or his American co-workers had little intimate knowledge of the technical phases attached to the Chinese side of the case, their opinion being influenced to a large extent by the advice of others. Naturally enough, the Chinese idea of construction companies or a consortium organized on a basis that would eliminate the financiers and bring in experienced constructors as principals in their railway contracts, was bound to be knifed by those whose interests were opposed to this system. This is simply another phase of the constant warfare between the great construction companies of the world who operate on a percentage or a cost-plus-a-fixed-sum basis, and the adherants to the other system which concentrates all the power under an individual engineer-in-chief, directly responsible to the banks. Both systems have their advocates. The superiority of one over the other is purely a matter of opinion, as a rule most biassed opinion based on self-interest. The Chinese have learned that the engineer-in-chief or departmental system of building railways has many drawbacks and, in 1914, definitely embarked upon a program for building their lines under the other system. It was only natural that a program recognizing the rights of their banks to participate in the issueing of the loans, and their capital to enter into partnership with foreign construction companies would be revived when the opportunity presented, as the same group of officials who sponsored the 1914 program were again in power in 1919.

Consortium leaders are inclined to stress the point that its organization has had the good effect of developing the formation of a group of native bankers for the purpose of co-operating in the issue of internal silver and other loans, but they overlook the very important fact, that in 1914, in the organization of the international construction company, the official British, French and German groups who stood behind their constructors, conceded to the Chinese banks participation in the profits of issueing the loans, the establishment of branches of the Bank of Communications in London, Paris and Berlin with the right to act as depositories for a fair share of the loan funds, as well as the privilege of Chinese capital to participate in the construction profits. That much had been gained for China in the negotiations that were characterized as illegal and in violation of the treaties by Secretary Bryan. The Chinese gained handsome concessions from the European groups at that time, and resented the ignoring of their position when their proposition was turned down in 1919 at the peace conference.

With a knowledge of these facts it is difficult to see where the consortium can take unto itself any undue credit for forcing the Chinese bankers to rely on themselves, or for the tardy recognition of their privilege to participate in future consortium loans to their government. On the other hand it would appear to represent a determined effort on their part to oppose the new consortium for its failure to recognize the concessions gained for them in 1914. For, it must be borne in mind, that the Chinese officials who stood behind the 1914 program, are the same gentlemen who to-day dominate the finances of China through their pre-eminent positions as presidents or large shareholders in the many semi-official banks which form the backbone of the new banking system in China.

The difficulties confronting the consortium at the present time, with an important section of public opinion in the United States declaring that it has outlived its usefullness by reason of the treaties signed at Washington, should compel attention to the facts disclosed in this article. The arguments in favor of its existence overwhelmingly outweigh those in contra, and a supreme effort should be made to conform more to the spirit of the times in recognizing the right of the Chinese to propose some program that may serve to bring harmony out of discord.

Nothing that the consortium can now do will outweigh the results of the Washington conference. The contracts pooled by the various groups are not worth the paper they are written on, if the Chinese determine to hold out for the full exercise of their sovereign rights to dictate how, where and when, their new railways shall be built. This is the crux of the situation. The question of whether the lines are to be built departmentally or under the percentage system is a minor one. The Chinese say to the world, "we want our own national system of railways for the development of our country along lines that will add to our own prosperity, and not that of leased or treaty ports outside the jurisdiction of our government. Surrender your pooled contracts to us, so that our sovereignty over these rights is fully restored; give some practical evidence that the principles you loudly proclaim are to be carried into effect. In return, we will accept the proffered assistance of the consortium to finance and construct a national system of railways equal at least in mileage to the lines surrendered." This is the first step in the program. The question of how the lines are to be constructed, operated and managed are secondary considerations.

It should not be difficult for the consortium leaders to find some solution to this muddle. The last administration failed to understand the Chinese, and it is again up to the practical statesmen of the Harding cabinet to put into practice a policy that their predecessors appropriated from others and were unable to carry into effect.

If there is any sense of justice in the make-up of the present administration at Washington, the rights of the 1914 international construction company in the building of Chinese railways, calls for careful consideration. The former administration not only arbitrarily declared the company illegal and in violation of treaty provisions, but four years later, when it found that its own misdirected activities had effectively closed the door to independent American operations in China, invited the organization of another international combination to supplant it.

The future of the present consortium, as far as the construction of railways is concerned, would seem to lie along lines that will take the solution of the Chinese railway problems out of the hands of bankers and lawyers and hand it over to railway experts. The consortium has faithfully carried out the dictates of the foreign offices. It has proved its worth as a political instrument. The results of the Washington conference however deprives it of any further political significance and provides the opportunity for its critics and enemies to advocate its dissolution. If it is to succeed it must function. If it fails to function it will stand as a monument to the inefficiency of American diplomacy. Harding and Hughes saved the nation from the complete breakdown of our diplomacy in the Far East by calling the last conference. They can save the consortium and our national prestige by similar sensible methods.

The bankers have nobly fulfilled their function by paving the way. Let them now retire gracefully and permit experienced railway constructors to come to the front, complete their work and together divide the honors of success. Let the American group turn to Mr. J. G. White and W. F. Carey, to organize an American railway construction company, a guarantee that American prestige and business honor will be upheld in dealing with the Chinese; let the British group bring about a combination of the Pauling and British and Chinese Corporation interests to act for them in the construction of Chinese railways: let the French group support M. Edouard Gouin, of the Societe Construction des Batignolles, the foremost railway builders of France, and the Japanese get behind a construction company organized from the engineering staff of the South Manchuria Railway Company, with their intimate knowledge of railway construction in China, and then, when these preliminaries are completed, let Mr. Hughes call these experts to sit around a table in Washington with Yeh Kung-cho, C. C. Wang, K. S. Kwong, or other acceptable Chinese representatives. In one or two sittings the deadlock will be broken and a way found to commence construction on the much needed transportation system of China.

The consortium will be there very much in evidence standing behind the construction companies (in which Chinese capital will be admitted to a fair participation), retaining the power, but the detail work handled by men who know their business. The consortium will stand for the purpose of administrative and other development loans, but the railway program will remain outside its immediate control. The British, French and Japanese groups, have, in the past, expressed a desire to be relieved from supervision over Chinese railway construction, prefering to have the constructors act as principals and bear the brunt of settling the many petty technical questions that arise daily in the course of Chinese railway construction.

If the consortium is to function, something should be done without waiting for the Chinese to arrive at the brink of bankruptcy and compelled to accept its terms as the only way to avoid international control over their finances. Good business judgment and wise statesmanship should forsee that under such circumstances, the Chinese will feel dissatisfied and resentful. Harmony and good-feeling is highly essential to the success of the consortium.

I do not hold that the plan outlined is flawless, but imperfect as it is, it recognizes certain important facts that the last administration repeatedly ignored, until their acceptance became compulsory. There is a solution to the consortium problem in the above ideas, and if the bankers will consent to step aside while Secretary Hughes calls into conference the expert railway constructors of the consortium powers and representative Chinese engineers, a way can be found to co-operate with the Chinese in some legitimate manner that will break down their opposition and permit the consortium to function.

Geo. Bronson Rea.

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# Addis Advocates New Consortium Policy

Negotiations with autonomous provinces of China for the construction of railways rather than the complete suspension of activities on the part of the Chinese consortium because of the present division in the government of that country, is advocated by Sir Charles Addis, chairman of the Hongkong & Shanghai Banking Corporation, director of the Bank of England and head of the British group in the consortium. Sir Charles was the guest of honor and the principal speaker at a luncheon given by Thomas W. Lamont, of J. P. Morgan & Co., at the Downtown Club of New York on March 28.

Sir Charles also believes that despite unsettled conditions in China, which have become a bar to much of the proposed financing by the consortium, there is still the possibility of arranging a comprehensive funding loan for the conversion of the Chinese floating debt. After reviewing some of the troubling conditions which have arisen out of the difficulties between the factions of North and South China, Sir Charles said:

"In the face of all these contradictory compensatory factors what policy ought the consortium pursue? Clearly we cannot take sides in this matter, or support one political party against the other, until, we are assured that they are in the way of composing their differences and have the will to unite. I do not think the same objection would lie against a comprehensive funding loan for the conversion of the floating debt, since that would inure to the benefit of all parties, but with that exception the consortium is, for the present at any rate, debarred from undertaking government loans for administrative purposes in China.

"Indeed, I will go further and say that it seems to me unreasonable to hold up the development of communications in China while the government is engaged, it may be for a generation, involving a new political system. In my judgment the time has come for the consortium to consider the practicability of negotiating independently with an autonomous, or group of autonomous provinces for the construction of specific railway undertakings within their respective borders."

Sir Charles expressed optimism concerning a final settlement of China's internal strife. In this connection, he said:

"The process may be slow and tedious and I can understand the impatience of those who would like to accelerate it by placing China under the tutelage of the foreign powers. I can understand that policy, but I am convinced it is a chimera. In the last resort, foreign intervention implies the sanction of force, and the employment of international force in order to coerce China is not a practical policy. China must work out her own salvation. All we can do is to stand by and, in the words of the Washington conference resolution, provide China with the freest and most unembarrassed opportunity of developing and maintaining for herself an effective central government.

"Such is the instinct for law and order, the capacity for self-government of this extraordinary people, that 1920, the last year, for which figures are available, marked a new record in their foreign trade. Last year's customs revenue was larger than ever before. In spite of the depredations of the tuchuns (military governors), there was a surplus of the salt revenue, after paying all the foreign charges secured in it, of $51,000,000, and the railways showed an estimated free surplus of $24,000,000."

Referring then to the work of the consortium formed in October, 1920, Sir Charles said:

"Consider what the consortium has done, is doing, for the people in China. It has succeeded in establishing an effective check upon the senseless and corrupt government expenditure which was rapidly plunging the country into bankruptcy. I believe I am justified in saying that the profligate borrowings of foreign moneys, which were menacing the integrity of China by a system of insidious financial penetration, has practically ceased since the formation of the new consortium.

"Furthermore, acting on the principle that heaven helps those who help themselves, the consortium has encouraged and developed the formation of a syndicate of native bankers for the purpose of co-operating in the issue of internal silver loans. Apart from its economic justification, in encouraging thrift and utilizing the national savings for national purposes before seeking assistance from abroad, I attach the greatest importance to this movement as a means of giving men with a stake in the country an interest in good government and a strong incentive to work for its rehabilitation.

"It is the bane of Chinese politics, an inheritance from the old *régimé*, that they have been left too much in the hands of the *liberati*. Until we can get the business men, the men with a stake in the country, to join hands with the educated classes, we shall never secure the formation of that sane and sound public opinion, upon which, in the last resort, governments must depend for their power and foreigners for their security."

The continuation of the consortium is a factor of great importance in international affairs, in so far as they are related to the Far East, Sir Charles believes. In reference to this he said: "Drop the consortium and to-morrow the policy of spheres of interest will be revived. That is in the nature of things. Reverse the process by which the co-operation has been substituted for competition and the creditor nations will be forced in self-defense to safeguard the area of their securities.

"There is nothing except the consortium which stands between China and the resumption of spheres of interest, and no one who recalls the international rivalries and jealousies which marked the period, known as the Battle of Concessions, with all its after-

SIR CHARLES ADDIS

For Many Years Chairman of the Court of Directors of the Hongkong and Shanghai Banking Corporation, Director of the Bank of England and Head of the British Group in the Consortium. **Unquestionably, the Greatest Authority on Chinese Finances and Railway Problems.**

math of territorial aggression and international wrongdoing, will consider almost any sacrifice too great to avert the renewal of such a calamity to China, such a menace to the peace of the world. The consortium has justified itself and will continue to justify itself so long as we stand together. Never were its claims to your consideration and support more insistent, more clamant than they are to-day."

# Personalities and Policies Among Chinese Bankers

### *By Joseph W. Hall*

THE joint-stock bank, as developed in Europe and America, is an institution not indigenous to China but which has, since the revolution, taken to her soil in a manner so flourishing as to be almost alarming. It fits in well with the Chinese liking to keep their money in a liquid state, in which they can, so to speak, frequently pass it through their fingers. The high rate of usury pertaining in China and the profit obtained from the various unstandardized currency units makes it possible for the Chinese-controlled bank to operate under the excessively proportioned overhead common to Chinese business and yet show dividends—which indeed average around fifteen per cent. Again, in money-changing, accounting and lending the Chinese have a skill acquired through ages of experiences. There now exist a dozen "native" banks with a paid-in capital ranging from Mexican two to eight million dollars and averaging about three million, and several score more with paid-in capitals of less than two million.

Chinese bankers of the first generation, being unable to cast off the traditions of quick wealth through political power, devoted as much of their attention to the manipulation in their favor of state and federal politics as to the more praiseworthy development of the country's resources and trade. But there is evidence that already among Chinese financial leaders a more progressive generation are rising, who possess higher ideals and sounder economic conceptions, and who are taking upon themselves the burden of improving not only banking but governmental finance as well.

Of the politician type is Liang Shih-yi—because of his spectacular career the most widely-known god of the banking pantheon. Liang's recent short-lived "come-back" into official life, this time at the head of the government, was popularly described by the pun: *Tsai shen tung shen*, or "The god of wealth is becoming active." Although China's "Wealthy Gods" are many, the fortune of Liang has been attained through such boldly speculative means that to him is reserved for nickname *Tsai Shen* —the god of wealth himself—the most-worshipped dicty of the Chinese pantheon, whose image, usually in a glass case, is found in the place of honor in every Chinese shop and over the bed of every merchant.

Mr. Liang's personal appearance and address are in strong contrast to his reputation as a reckless plunger and a political

**"THE GOD OF WEALTH"**

**Liang Shih-yi**

China's most daring financial plunger and political adventurer of the Republican Era, who is the dean and leader of the first generation of joint-stock bankers developed in China. Liang has been on leave of absence without resigning longer than any Premier in history.

**Tsao Ju-lin**

Leader of the New Chiaotung (Railway) Clique, and President of the Bank of Communications.

**Mr. Chang Chia-ao**

Vice-President of the Bank of China, Father of the Chinese Bankers' Association (commonly called the "Native Consortium" in distinction from the International Group.

**Mr. Feng Kun-Kwang**

President of the Bank of China.

**Mr. Chow Tso-min**

Head of the Kincheng Banking Corporation of Tientsin, one of the leaders of the new school or second generation bankers, whose policy is soundness and affiliation with commerce and industry rather than speculation and affiliation with politics and government finance.

**Mr. Hsu Un-yuan**

A Graduate of the University of London, Vice-President of the Chinese-American Bank; the outstanding advocate of financial co-operation with America.

**Chow Tsz-chi**

Closely identified with Liang Shih-yi in financial matters and large shareholder in many semi-official banks. Minister of Finance in the last Cabinet, and until recently acting premier in the place of Liang. One of China's most astute financiers and promotors.

agent untrammeled by qualms of conscience. He is fifty-two years old, of a retiring disposition, and in an interview or on the platform speaks with an air of extreme humility combined with scholarly culture. Although possessing some knowledge of Japanese he converses only in the mandarin and his native dialect. He is a Cantonese (most of China's financial and commercial leaders are southerners) of a merchant family who are the financers of many silk and produce shops in the southern ports and Shanghai. His first venture following the completion of his classical education, in which he took high honors, was the establishment of various transportation and trading companies for the exchange of peculiar local products between north and south China. In the first year of the republic (1911), as reward for his service in pursuading fellow-provincials to accept Yuan Shih-kai as president, he was made by Yuan acting vice-minister of communications. He had previously held the post of director of railways. Just at this time the struggle between Peking and the provinces for the control of the railways was in progress, and Liang took active part in encouraging the idea of state monopoly of the industry. The great opportunities for wealth to a few men in gathering into their hands the chief railway construction projects of the country did not escape Mr. Liang. With his successor in the office of director of railways, Mr. Yeh Kung-cho, also a Cantonese, he organized a "Railway Association" among the men who comprised the technical and financial management of the government railways of the time. This association saw to it that its members were liberally provided for in all railway concessions and construction projects. Liang also occupied an important position in the Bank of Communications, and so consolidated his hold on that institution that, although he was accused of almost ruining it to finance his chief's monarchical scheme, he maintained himself in the chairmanship of the board of directors. He occupies a director's chair in six other of the native banks which have been promoted in ten years of republican *regimé*.

After Yuan Shih-kai's failure Liang spent some time in Hongkong and some in Japan, where he promoted affiliations with Japanese financiers and statesmen. During this time he engaged in five large, as well as many small, ventures of a wildly speculative nature. His *Hsu Tung* Company, which exported coolies to France and was, after wide-spread protest, suppressed, lost hundreds of thousands of dollars in this venture and in rouble exchange gambling in Harbin. Not only have its shares become worthless but it has large unsecured overdrafts in native banks.

Mr. Liang has been able to maintain his financial prestige to a great degree through the Bank of Communications, in which he controls a large share of the seven-tenths of non-official capitalization and has usually had the support of the three-tenths of official shares, although these have now gone over to Chang Tso-lin. The recent difficulties of the bank, Mr. Liang's personal obligations thereto, and the growing insistence of the "younger set" in the bank, particularly in the branches, on a re-organization along better business lines, which they believe will alone save the institution, greatly threaten Mr. Liang's influence. It is probable that he as well as the class of men of whom he is the most conspicuous representative, will be compelled to retire before the new type of banker being developed at Shanghai, who relies upon modern business rather than political intrigue. The other leading figures of Mr. Liang's class are Mr. Chu Chi-chien, minister of communications under Yuan Shih-kai and confident and recent personal diplomatic emissary of President Hsu Shih-chang; Chow Tze-chi, a sophisticated old Chinese who spent a score or more of years in the consular service in America and returned to become satrap of Shantung and more recently minister of finance; Yeh Kung-cho, railway expert and political intriguer; and Tsao Ju-lin, ex-minister of finance, communications and foreign affairs, a once brilliant figure in Chinese politics who was permanently dimmed by the students in 1919. The first two are Liang Shih-yi's chief supporters in his control of the Bank of Communications.

It must not be thought that there exists an open break between the old faction and the new. The cleavage, as all cleavages in China (which is one secret of the westerner's inability to comprehend the country) is not clear-cut. The two sets of financiers are growing apart rather than breaking apart. At present, interlocking directorates and the holding by one bank, of stock of others are the dominant aspects of the Chinese banking world. More and more, however, the "old bankers" find themselves over their depth and compelled to turn their projects over to the new set, just as previously the government departments which founded many of the now existent banks, with the intention that they should be national financial institutions, found themselves over their heads and compelled to turn their projects over to the merchant politicians who have become the old banking clique.

Two influences are operating to put financial enterprise on a sounder basis. First is the urge of contact with modern business methods felt chiefly at Shanghai; even more convincing is the repeated lesson that success through politico-speculative methods, although apparently more rapid, is ephemeral. The Chinese are by nature conservative. Here is a case where the progressives in spirit are conservatives in method, and they are bound to win.

When the new consortium endeavored to make itself felt in China, Mr. Liang put forth every effort to form a Chinese group, with himself at the head. His endeavor was frustrated by the "new bankers"—as they are popularly called—who refused to place themselves under his leadership. As a countermove the most progressive spirits, such as Chang Chia-ao and Chow Tso-min of Peking and K. P. Chen and K. C. Yeh of Shanghai organized the Chinese bankers' association for financing state enterprises under supervision. This combine has become within the space of a few months the most influential factor in native finance. Borrowing the tenets of the consortium as to close supervision of loan expenditure, it took up the government railways rolling-stock loan for six million silver dollars and soon followed this by another similar advance. The organization is of a sort that agrees with the Chinese genious perfectly, allowing the greatest freedom of action among the members. The plan of operation is of the "Lloyds" type—that is, although the group act together in floating new projects and protecting the interests of members, each particular project is considered and offered to the member banks separately, they being left free to underwrite to the extent to which their ability and inclination dictate.

These bankers, driven to adopt an attitude of hostility to the consortium by the attempt of the foreign groups to ignore them, have c-ooperated with the "old-line" faction of Liang Shih-yi to make the consortium as at present constituted forever unworkable in China. They have, however, been the first to recommend to their government the utilization of foreign capital in developing resources and state enterprises provided the same can be procured on terms acceptable to the Chinese people. This means that foreign money must wholly abandon the idea of security through available diplomatic pressure of its government upon the Chinese government. It means that all political aspects of the coming of such money to China must be negotiated through the Chinese bankers, who insist, with the backing of the people at large, on being the middleman between their government and foreign capital. It does not mean that the capitalists will be unable to procure the utilization of foreign technical experts as an assurance of efficient use of loan funds, but it does spell the death of the type of financing which has prevailed in China during the halcyon days of the concessionaire.

It means that there will be no future security for any investment other than its value as a business proposition. There are indications that at least one dominant group in the new consortium, is willing to recognize, and conform to, the new situation.

The "New Bankers" have shown their spirit by establishing bankers' clubs in Shanghai, Canton, Hankow, Tientsin and Peking; and publishing a weekly review in Shanghai and monthly magazine in Peking professing to be "devoted to economic, financial and commercial topics and banking practices in China." The Peking group naturally specialize in government finance, and are endeavoring to force business methods, for the sake of self-profit as well as altruism, upon the ministry of finance; while the Shanghai, and to a lesser degree the Hankow, Tientsin and Canton groups, specialize in exchange and commercial credits, and general banking business as it is known abroad. There is, by the way, no north and south scism between Chinese bankers, nor between Chinese business men of other types, although, of course, the Canton and Hongkong bankers tend to confine themselves to their respective fields.

The moving spirit among the new set in Peking—and the man mainly responsible for the group loans to the Chinese government, is Mr. Chang Chia-ao—an alert, although somewhat reserved Shanghaiese slightly under middle age, who speaks English well. Of quick decision and convincing argument, he is an able committeeman. He has, through sheer ability, become vice-governor of the Bank of China, and is the active spirit in that institution, working well under the highly respected but passive governor, General Feng Keng-kwang. He is reinforced through his brother in Shanghai.

A man of Mr. Chang's type is Mr. Chow Tso-min, general manager of the King Cheng Banking Corporation which, although only four years old, has attained an enviable reputation for originality and aggressiveness. The head office of Mr. Chow's bank is in Tientsin, now in the fine former Deutsche-Asiatic Bank building. Mr. Chow is a Japanese returned student, as are the majority of the "new bankers." He began his business career with various small trading enterprises, in which he was very successful. Since 1919 he has been the vice-Chairman of the Peking chamber of commerce. Foreign representatives of the consortium have confessed their respect for his business instinct. Messrs. Chang and Chow are the leading representatives of the bankers' association and chamber of commerce, respectively, upon the commission for the tabulation and liquidation of foreign and domestic obligations created by presidential mandate of February 22nd, 1922. This commission is the concrete result of a demand on behalf of the progressive bankers for accurate, complete and convenient statistics as to the present condition of liquidation of the loans contracted though a decade of wild-cat government finance and for a definite program of amortization.

**Marshal Chang Tso-lin**

The overlord of Manchuria, who runs his own financial institution, The Bank of the Three Eastern Provinces, reported to hold $30,000,000 of his personal funds. He came recently to the assistance of the Bank of Communications and by reason of his strangle hold on this important institution is the most important financial figure of China.

A collaborator of these two men is Mr. Wu Ting-chang, of the Yen-yeh or Salt Commercial Bank, Mr. Wu, who is a native of far away Szechuan, is a former vice-minister of finance. He has, within the four years of its existence, made his bank a powerful influence in the banking community. The head office is housed in a modern building on Hsi Ho Yien, "Bank Street" in the old city of Peking: and eight branches have already been established.

There is associated with the "new bankers" a small but highly respected school which is even more conservative in the matter of speculative enterprise. These bankers go the limit, in refusing all dealings whatsoever with the government. They are a product of Shanghai, which has come to bear toward Peking the natural suspicion of the merchant toward the politician whom he regards as "toiling not, only spinning words." Some of their banks maintain branches in Peking—although as a rule they do not venture beyond the foreign-policed concessions—but these branches are under careful orders to avoid relations with the ministry of finance.

Although it would seem that the active program of the new bankers who are pitching in with bared arms to the task of cleaning the augean stables of government finance is more calculated to help the nation than the policy of those who studiedly avoid this plague-spot, nevertheless the attitude of the "Conservatives" is a valuable balance upon their more enthusiastic contemporaries. Their strict adherance to commercial banking as it is practised in America or England is an assurance to budding Chinese trade and industry and their imported ethics are an excellent example to financiers who lack the restraint of business traditions.

A prominent "Conservative" is Mr. K. C. Yeh (Yeh Ching-hwei) of the National Commercial Bank, Shanghai. This is the dean of "native" banks, having been formed three years before the fall of the dynasty as a financial organ of the Chekiang provincial railways. The disappearance of the Chekiang Railway Company through incorporation into the national government railway administration caused the head office of the bank to be transferred from Hangchow, the capital of that province, to Shanghai. Mr. Yeh, who had gained banking experience in the Ta Ching or Imperial Bank (upon the foundations of which arose the present Bank of China) became head of the institution. Mr. Yeh is a man of retiring although most affable manner, and constant devotion to business. He is sympathetic but always firm. Under his management the National Commercial Bank is establishing an enviable reputation for soundness. One of the striking features of China's "Money josses" is their relative youth. The oldest nation in the world has probably the youngest financial dictators. Few of the bank heads are past forty-five.

A man as aggressive, as Mr. Yeh is quiet, but who has an equal reputation for "safeness" is Mr. K. P. Chen (Chen Kwong-pu) of the Shanghai Commercial and Savings Bank, Limited. Mr. Chen is an American returned student who does not hesitate to use in his old fatherland all the resourceful methods for "putting things across" to which American business men resort. By inventive advertising he has built up what is probably the only real savings bank business among the native banks. But he refuses to allow a cent of his trust funds to go into projects bearing the governmental taint.

Of Mr. Chen's type, but falling slightly behind him in both rigour and vigor is Mr. Swen To-yu, managing director of the Chung Fu Union Bank, with head office in Tientsin. This bank is also making a start in the savings department, but has been most notably successful in exchange business, both domestic and foreign. For several reasons savings banking does not yet flourish in China. If any institution can establish confidence it has no difficulty in procuring all the money which it can capably handle from shareholders and depositors able to supply capital in large lumps. As long as this condition prevails, and there is felt no need for mobilizing the hoardings of the small merchant and artisan, bankers will not greatly trouble to develop this more complicated form of banking. Nevertheless herein lies a tremendous, untouched field, for Chinese are all savers, and hid away about the hovels of the middle classes and poor are hoardings aggregating fabulous sums. These can be organized to an extent through skilful educative campaigns, but full confidence on the part of their possessors will only come with a stabilization of political and social conditions. It has been repeatedly demonstrated that a gambling scheme will bring out hoardings much quicker than savings-account facilities. The present collapse of aleatory exchanges is giving savings account banking a great setback.

There is another set of Chinese financiers who operate in co-operation with foreign capital, under the recent Chinese laws governing the incorporation of sino-foreign joint-stock firms. The pioneer sino-foreign banks were the Sino-Japanese Exchange Bank of China, capitalized at ten million yen; and the Chinese-American Bank of Commerce, financed on the American side by the Stone-Wiggin interests, and which has a paid-up capital of U.S. $10,000,000. The leading figures in Sino-Japanese finance are Mr. Lu Tsung-yu, an ex-official; Mr. Li Shih-wei, an ex-minister of finance who never assumed office; and Tsao Ju-lin, mentioned above. The outstanding advocate of financial co-operation with American capital is Mr. Hsu En-yuan, a returned student of political as well as business acumen. With him is associated in a more or less honorary capacity. The Honorable Chien Neng-hsun, a former premier.

The phenominal success of these institutions is responsible for a fever of sino-foreign promotion, and two Sino-Italian, one Sino-Scandinavian, and one Sino-British Bank are among the institutions launched within recent months, while numerous others are projected. Commercial and manufacturing companies of all kinds are being formed along the same line. Sino-foreign banks do not as yet, however, constitute a greatly influencing factor in the Chinese financial world. The Chinese-American bank has set a helpful precedent by co-operating with the Native Bankers' Association.

The banking institutions of all the foregoing groups are ambitious to be nation-wide in scope. Their plan is to establish branches first in the busiest treaty-ports and gradually reach out toward the interior, although with the exception of the semi-government Banks of China and Communications, they have not yet gotten beyond the port cities. There are developing in the individual provinces, however, merchant financiers who are working within provincial boundaries for the assemblage and organization of the capital of their particular provinces, the financing of provincial and county governments, construction of public works, and encouragement of local industries, and commerce in local products.

The most flourishing development of this sort has taken place in the economically and politically independent province of Szechuan, and the self-assertive province of Shantung. The most highly-respected provincial bank is that founded by the great Szechuan firm of Young Brothers seven years ago. The bank now has branches in the treaty ports and Peking and correspondents abroad, but it exists primarily for the purpose of facilitating Szechuan's trade. Shantung has several growing local banking institutions the most reputable of which is the Shantung Bank, whose credit is better in the province than that of the national government banks.

Chief among the militarists who have turned financiers, is Marshal Chang Tso-lin, high inspecting-general of Manchuria. His Three Eastern Provinces Bank is capitalized at eight million dollars, and is under his direct managment. From this institution, which is reported to hold thirty million dollars to the personal account of the satrap, Chang was able to provide four million dollars in silver to save the Bank of Communications from the threatened collapse caused by the run at the last year end

Other militarists whose fortunes give them a place in China's pantheon of wealth are the ex-premier, Chin Yun-peng; the monarchist Chang Hsun; the high inspecting commissioner of Chihli, Shantung and Honan, Marshal Tsao Kun; and the ex-*tuchun* of Hupeh, Wang Chan-yuan—a typical Chinese provincial verres.

There remains one further class of capitalists of whom we may speak in much higher terms. These are the successful pioneer capitalists of the new industrial era which is dawning in China. They are men who have made fortunes by breaking away from the traditional merchantile methods to venture into quantity manufacturing with western machinery. Cotton spinning has thus far proved the most profitable form of manufacture attempted in China. In the Shanghai district a score of men have thereby accumulated sufficient wealth to become factors in the money market. The most picturesque character among them is Chang Chien, a man of determined ideas and ideals—a gentleman of the old school who seeks his country's salvation in the development of her material resources and her industrialization.

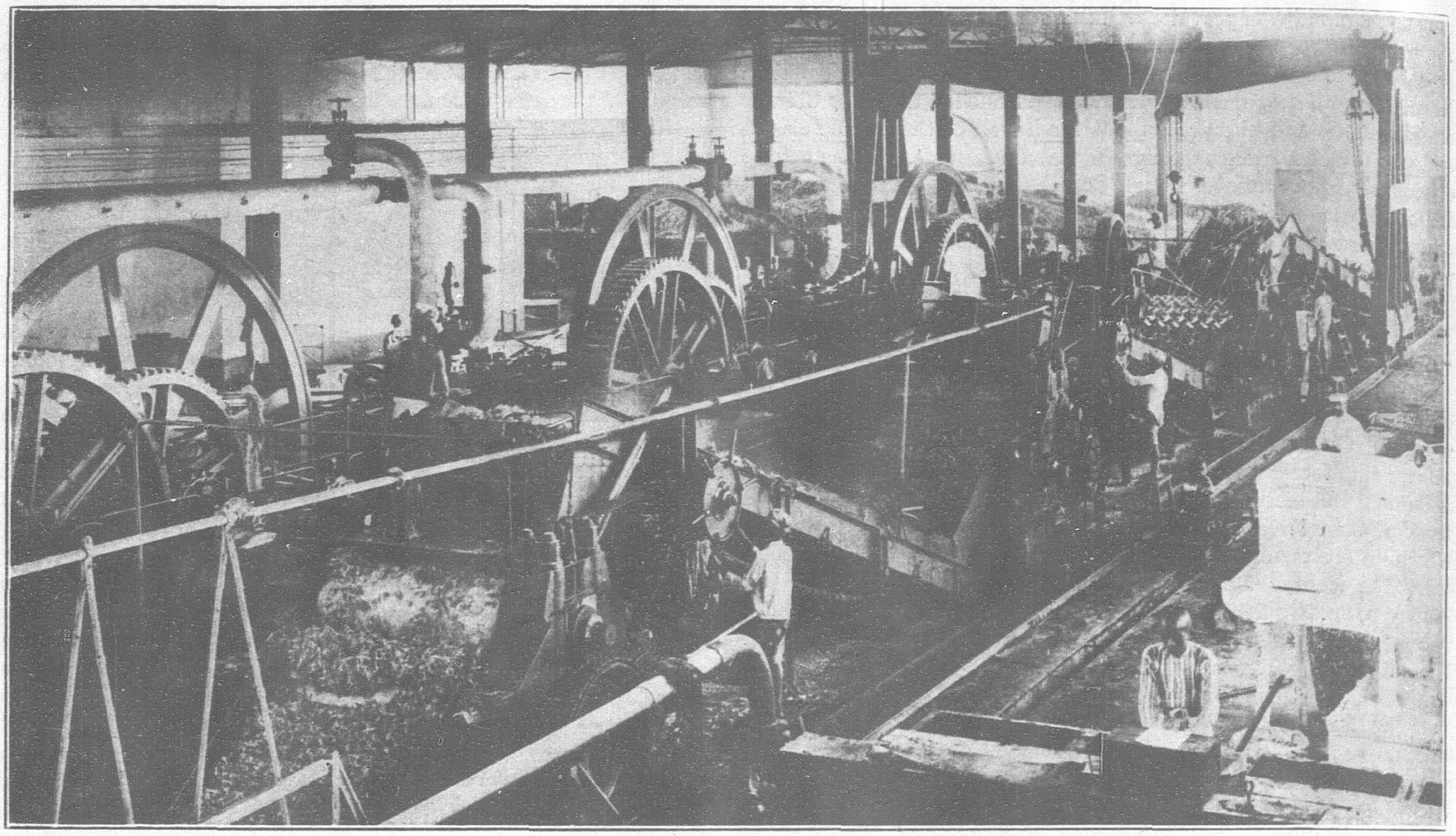
Chang Chien and his devoted collaboraters have transformed a piece of swamp land in their native county, one hundred miles up the Yangtze River from Shanghai, into the model manufacturing city of Nantungchow; he has, through his continued efforts, at last brought the attention of the Peking government to the serious problem of conservancy and port improvement on the Whangpoo and lower Yangtze; and he is now the key to the barrier which stands in the way of the Seims-Carey grand canal project. But his story is a romance in itself, which we cannot relate here. His chief interest to the subject in hand is the fact that he is founder and principal shareholder of the Hwei Hai Industrial Bank, operating in Shanghai and the cities of the lower Yangtze; and an important director in the National Commercial Bank described among the "Conservatives" above.

Manufacturing has not progressed so far in China's northern ports as in the Shanghai region: nevertheless the north has produced some pioneer captains of industry. Chief among these is Chow Hsueh-hsi, managing director of the National Industrial Bank of China. Mr. Chow, like Mr. Chang Chien, is a Chinese of the old type, who combines with his circumspect scholarliness a shrewd and aggressive business sense. He received his foreign education in Japan. In the third year of the republic he was minister of finance, and while holding this position projected the Peking waterworks. His enterprises include the largest cotton spinning mills in Tientsin and Tsingtao. He holds a large interest in the British-controlled Kailan Mining Administration, which has a practical monopoly of the coal industry in North China. He is also principal owner of the affiliated Chee Hsin Cement Company, a director of the Bank of China and shareholder in several other banks.

C. K. Yeh

Chairman, National Commercial Bank

China's newly developing capitalist class is composed of diverse elements. Its smallness compels a good deal of shoulder-rubbings, and a spirit of co-operation for purposes of protection and progress is growing. The sounder and more constructive elements are gradually coming to the fore. This development is earnest that China's government by military adventurers is to give way to government by industrial and financial captains—a decided advance, politically as well as economically.



A typical Java Milling Plant, showing Independent Crusher and two Three Roller Mills

# The Java Sugar Industry

### *By K. R. F. Blokzeijl*

THE island of Java is the largest producer of cane sugar in the Far East, it being favored with an especially suitable climate for the cultivation of sugar cane.

The commanding position which the industry at present holds among the producing countries of the world has been secured by an admirable organization for mutual assistance in all directions, above all in regard to research, and by the adoption of methods of cultivation and manufacture on which it would be difficult to improve, carried out under highly-trained and well-paid supervision. The most valuable assistance rendered by the experimental stations which are supported by the planting community, is one of the principal reasons for the progress of the Java sugar industry in the course of time. The agricultural section of these experimental stations consists of one main station and five substations at various districts of the island at which investigations in respect to soils, fertilizers, diseases of canes and varietal tests are made. Besides, there are technical and chemical sections. Every fortnight a report is received from each factory and the figures are carefully controlled, referred to the same basis and put in tabular form for comparison.

The laboratories of the chemical section are fitted with most up-to-date apparatus. There is also a splendid reference library for research work and a museum representing samples of sugar, molasses, cane, etc.

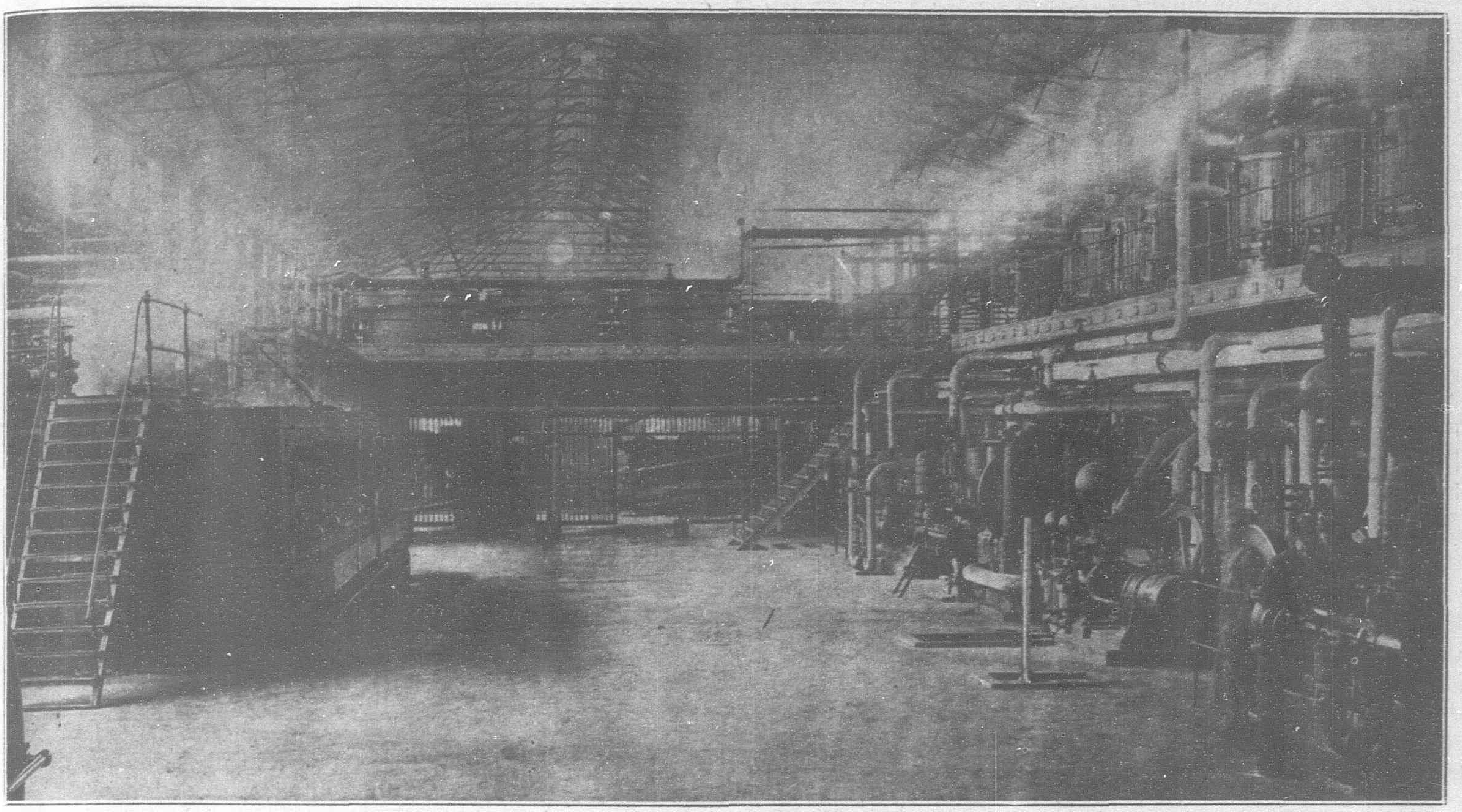
The technical section carries out experiments in the various factories on evaporation, boilers and furnaces, steam economy, etc., in order to try to improve the factories where necessary. All apparatus, such as steam and vacuum gauges, thermometers, meters, etc., are tested and calibrated before being delivered to the factories It is, for instance, through these investigations that the department has designed a form of furnace which permits the factories to burn additional fuel besides bagasse. Various other improvements have been made by this department, resulting in considerable economy of manufacture.

The sugar factories in Java are found, as a rule, in the densely populated districts in the low-lands, and in most cases it is not difficult to obtain the requisite labor. But during rice harvests, during the construction of great public works, or during an epidemic, labor is occasionally difficult to get. Such cases, however, are not frequent when compared to other sugar-producing countries.

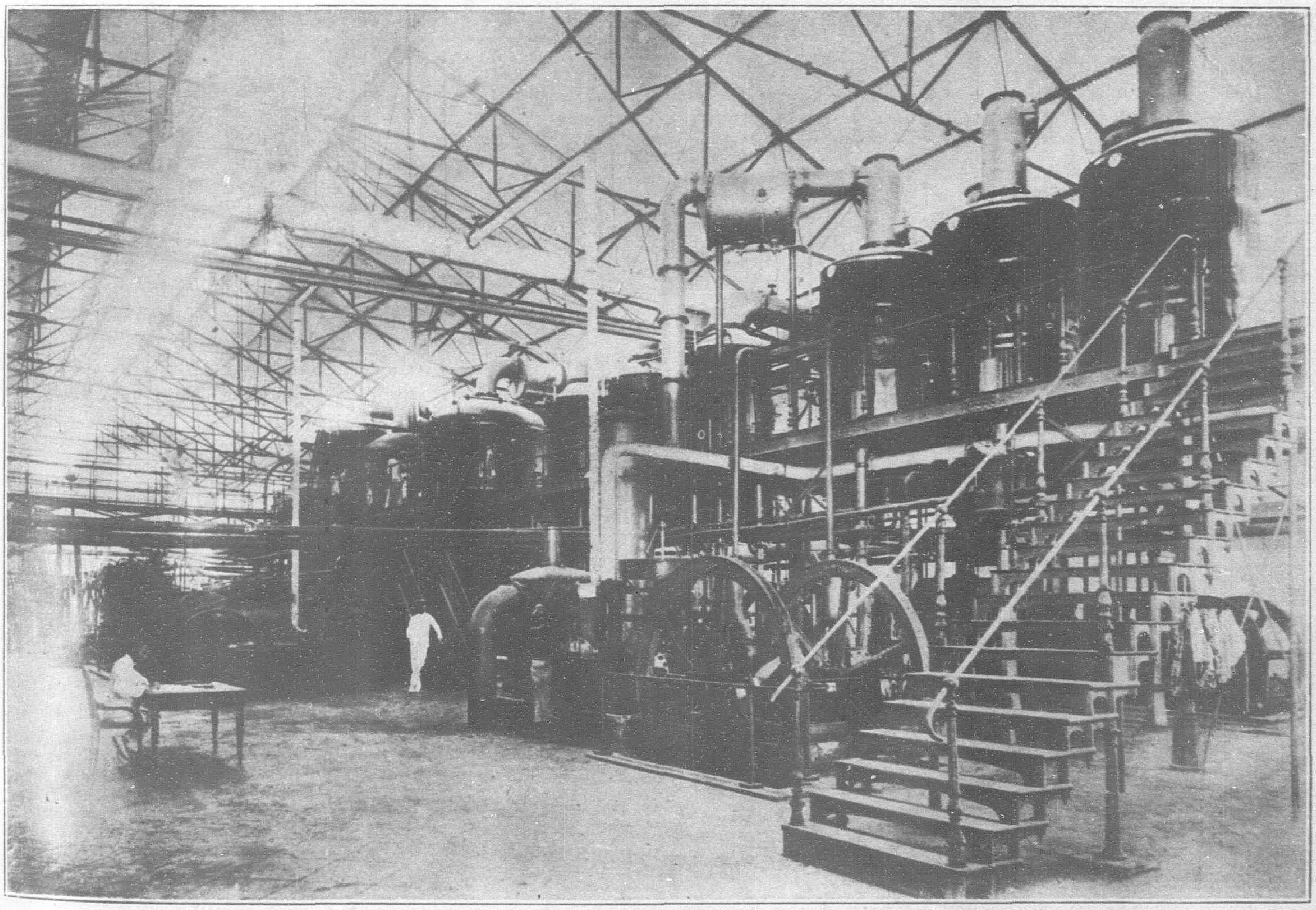
Only free labor is used. The heavy work is done exclusively by men, the light work, such as cutting tops, planting, watering and weeding are in many districts carried out by women. Children are also employed, viz., to destroy insects and to do similar work. The chief condition for a successful cultivation of sugar cane is an abundant rainfall during its growth and a period of interrupted drought during harvest time. Where Java is concerned, the farther one proceeds eastward, the more one may rely on a perfectly dry east-monsoon. Therefore, most of the sugar estates in Java are confined exclusively to the eastern and central parts of the island, that is to say, to the districts east of the line formed by the river Tjimanuk.

The cane requires a period of more than 12 months to ripen; other crops are planted on the same lands in sequence, cane being grown once every three years. The rotation of crops is roughly as follows:

| | | |
|---|---|---|
| 1st year | May till October | Harvest of sugar cane. |
| | October till November | Soya beans, maize, etc. |
| | November till April | Rice. |
| 2nd year | April till November | Indigo, tobacco, beans, etc., follow. |
| | November till April | Rice. |
| 3rd year | April till May/October of the 4th year sugar cane. | |



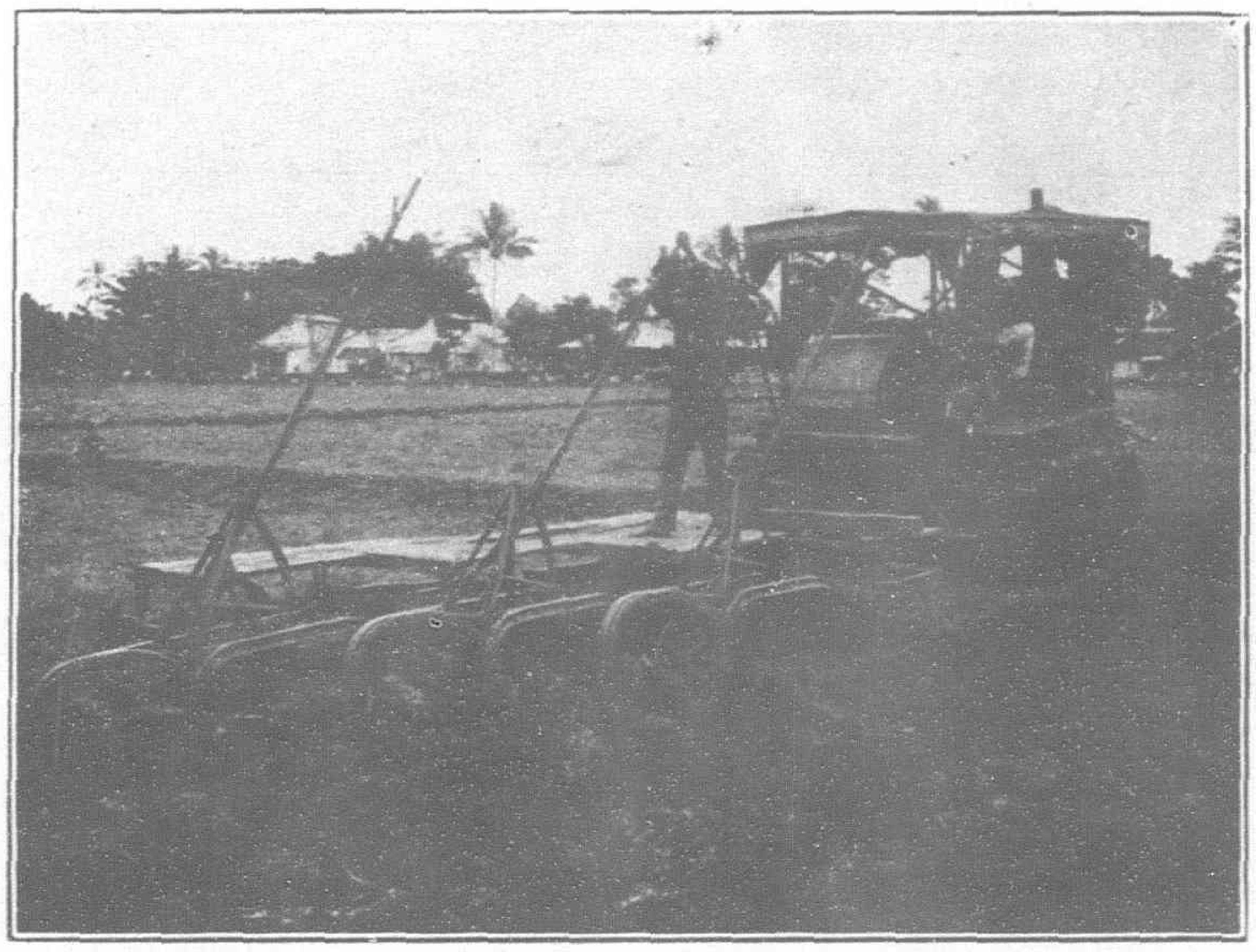
A typical Boiling House of a Java Sugar Mill, showing quadruple effect, Vacuum Pans and Circulating Pumps to the right and Clarifiers in centre.



Another Boiling House Installation, showing two sets of Triple Effects, three Vacuum Pans and Vacuum Pumps, the Pans discharging into a Crystallizer Battery. Behind the latter is seen the Centrifugals.

Planting Cane in Java: loosening the soil in the rows, all done by hand

A Young Cane Field

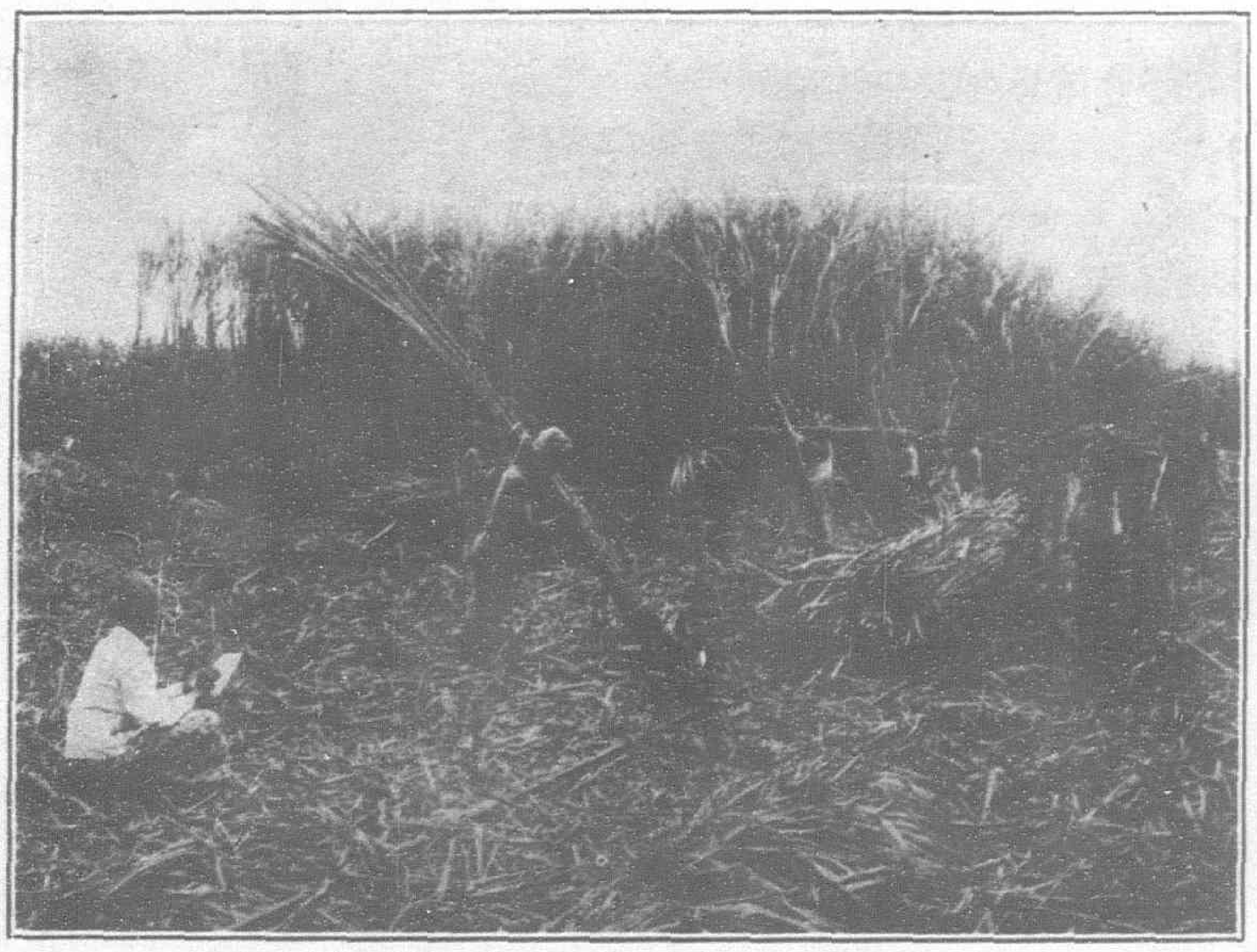


An American Caterpillar Tractor hauling a gang plow in Java

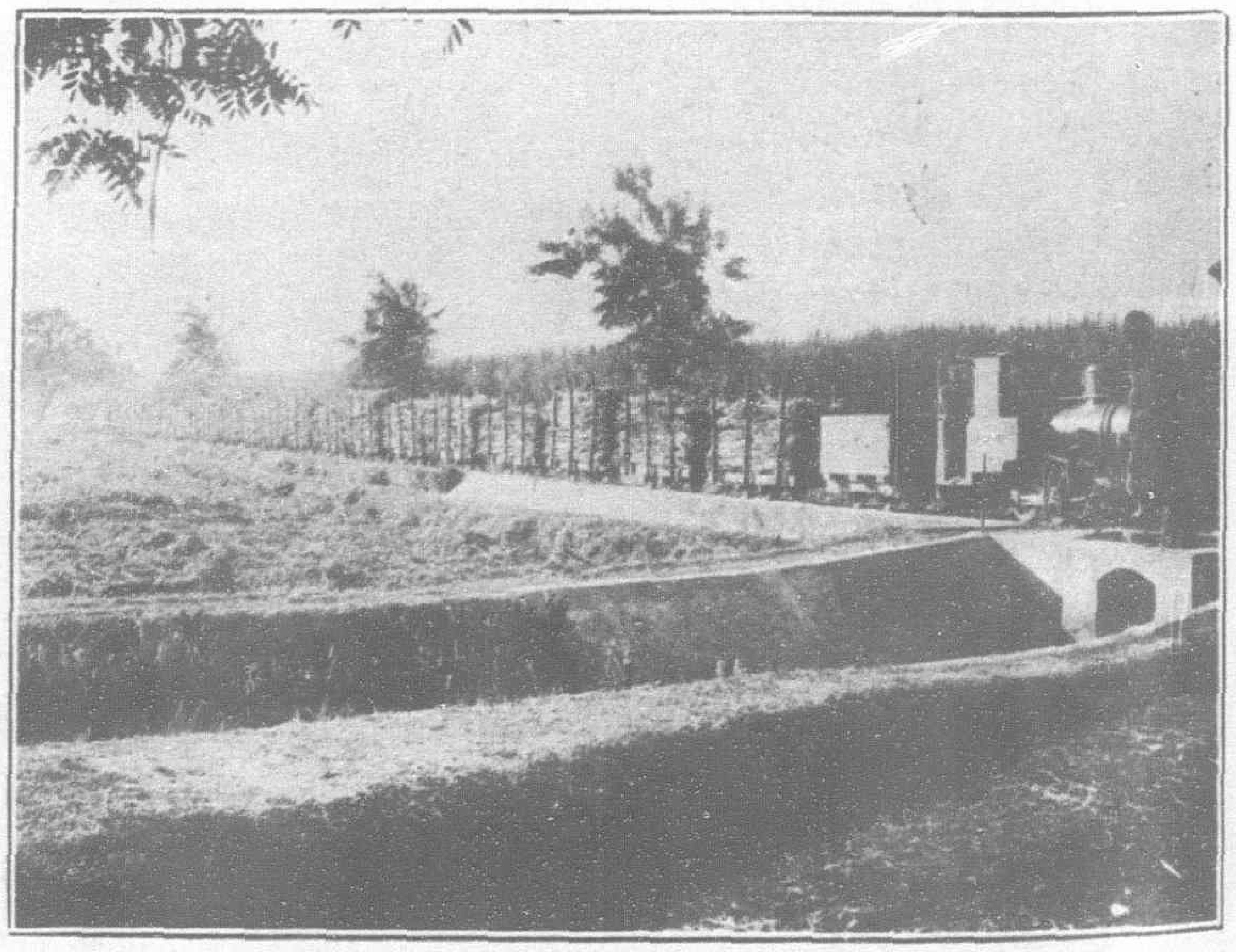
Of the crops being grown between two of sugar cane, the latter alone is cultivated by the European planter, while the other are planted by the native population on their own account and without interference on the part of the sugar manufacturer.

The excellence of the methods of cultivation in use on cane lands in Java has long been recognized. The trench system known as the "Reynoso system" is in general use on all factory lands. Cultivation is still carried out almost entirely by hand labor and little progress has been made up to the present in the adoption of mechanical methods. The first step taken is to construct drains. These are of two kinds, deep drains 2-ft. wide and 1½ to 2-ft. deep, and shallow drains 1-ft. to 1½-ft. deep. The shallow drains run into the deeper ones. Where the land has exceptionally good natural drainage, the deeper drains are dispensed with. On such lands the shallow drains are made 30-ft. apart, but when used in conjunction with deeper drains on land with poor natural drainage they are sometimes closer and may even be only 12 to 15-ft. apart. The larger drains are 120-ft. apart. This procedure results in a highly efficient system of drainage, and without it it would not be possible to grow cane on much of land in Java.

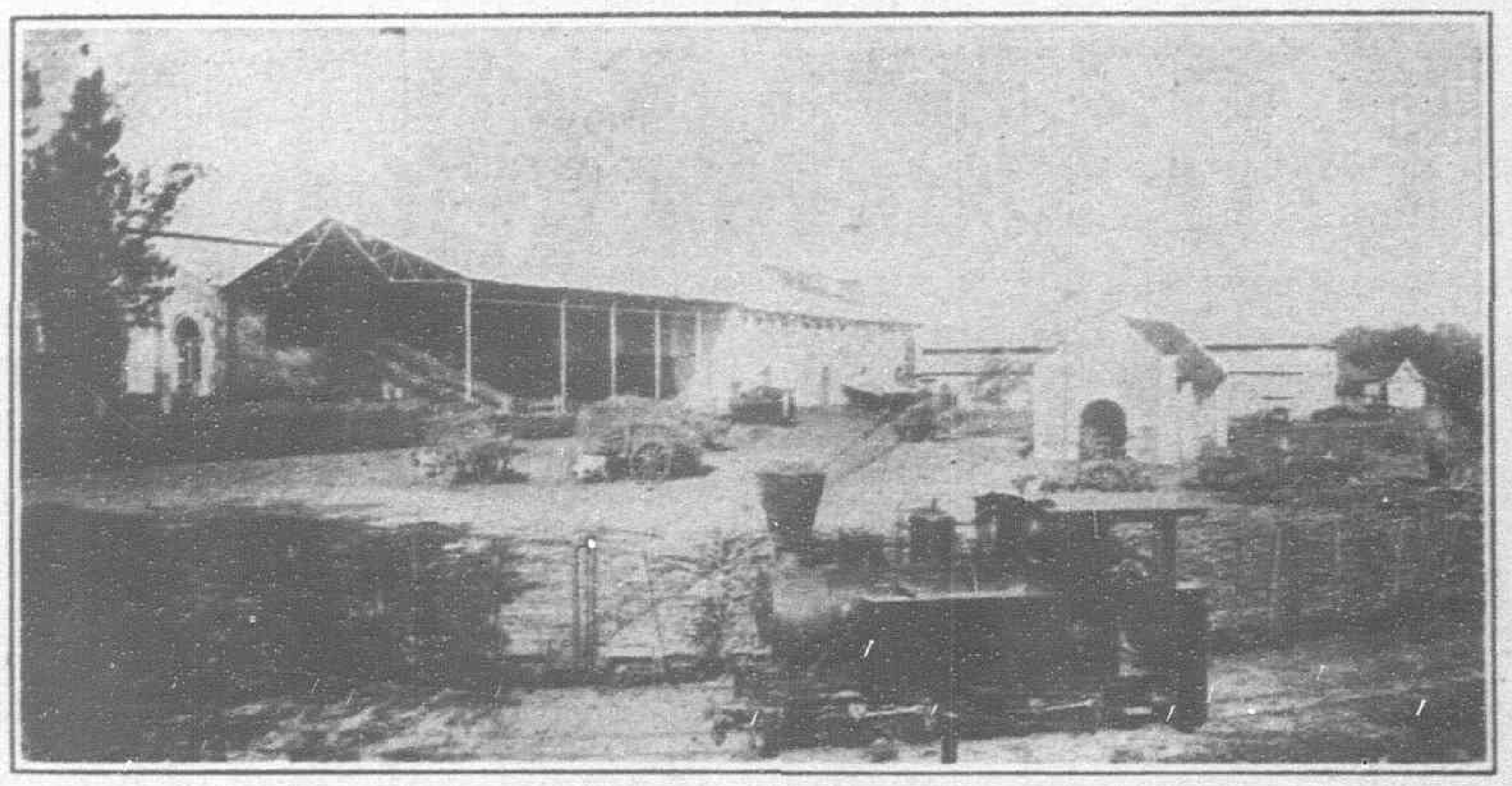
A prominent feature of the cane cultivation is the rapidity with which land is prepared for cane planting. Immediately after the construction of the drains is completed, the making of the trenches is begun. These are made between the smaller drains and are thus 12 to 30-ft. long. The standard dimensions are 4-ft. from centre to centre, 1-ft. deep and a little less than 2-ft. wide. After the trenches are made, the soil at the bottom is dug to a depth of six inches. The trenches are made gradually as the rice crop is removed and no preliminary ploughings are given.



Cane Cutting and Loading on Trucks



Transport of Cane to Mill



The Batey of one of the Smaller Java Sugar Mills

The sets are sown some six to eight weeks after the trenches are made and, as a rule, parallel to the sides of the trenches and only a few inches apart. The sets with young shoots are planted in a sloping position. Other sets are planted at a very shallow depth in the trenches and are often not completely covered with soil. As soon as the canes are planted, they are irrigated, the drainage channels being used as irrigation channels. The water requirements of the cane crop have been carefully worked out and cane is consequently grown with the minimum of water necessary. Weeding and shallow cultivation are done as required and, as the young canes grow, the trenches are gradually filled in. The canes are always thoroughly earthed up. This is done in three operations from October to December for canes which are planted in June.

The usual form of manure is sulphate of ammonia. In some soils which are deficient in phosphorus superphosphate is necessary, but its use is not extensive. Potash salts are not used; this chemical is present in the soil in sufficient quantities.

While the canes are still young, such pests as borer beetles, larvae of beetles and termites have to be caught, but as soon as the last banking is over and the rainy season has made the roads impracticable, all labor ceases. When the dry monsoon has once more returned, the trash is removed from the stalks and soon afterwards harvesting commences.

In the laboratory of the factory the cane is continually being tested, in order to ascertain how far it has matured. Then, when the roads have become dry, the ripest plantations are chosen for cutting. "Cutting" is merely a word, because the cane is dug out as far as the old sets and uprooted as completely as possible, the greatest care being taken to leave as little of the cane as possible in the soil. The adhering earth and roots are then removed and the tops with the green leaves are cut off.

The cane comes into the factory on trucks containing from 6 to 8 tons. These are run alongside the carrier and the contents are hoisted bodily from the trucks by means of an electric crane and deposited on a sloping platform, from which they are fed to the carrier by a rake which is worked mechanically.

The efficiency which, as will be evident from the preceding descriptions, has been brought to bear on the agricultural side of the industry is equally apparent in the factories. The machinery is of the most modern kind and the roominess and cleanliness of the factories conduce to high efficiency.

There are in all 186 sugar factories in Java. Of these the number which submit returns to the research station association varies from 138 to 145, but only 77 to 100 include information regarding engineering work. It is on these returns that the information which follows is based.

Few of the factories have mills (i.e., steam-driven rollers, between which the cane is caught and pressed) which consist of less than 9 rollers with crushers, or 11 rollers in all, and many have 14 rollers. The figures for the 77 factories referred to above are as follows:

| | |
|---|---|
| Factories with a crusher and four mills or fourteen rollers in all | 8 |
| ,, ,, four mills only or twelve rollers in all .. .. | 11 |
| ,, ,, a crusher and three mills or eleven rollers in all | 24 |
| ,, ,, three mills only or nine rollers in all .. .. | 33 |
| ,, ,, a crusher and two mills or eight rollers in all .. | 1 |

The cane, as a rule, has to pass through three sets of rollers which are placed one behind the other and is drawn from one to the other by means of automatic carriers. The rollers of the second set are placed closer together than those of the first, and those of the third closer than those of the second. By these means nearly all the juice is extracted from the cane. While passing from one set of rollers to the next the bagasse is sprinkled with water in order to dilute the juice still left in it. The diluted liquid is extracted in the next crushing. The residue, which after having passed through the three mills still contains half its own weight in diluted juice, is carried by means of a movable platform to the furnaces and is there used as fuel for the boilers of the steam engines which supply the power for working the factory.

The juice obtained by the process of pressing is freed from all foreign matter by means of strainers and is then mixed with milk of lime and boiled. By this process the liquid is divided into a clear light colored juice and a dark colored one into which the impurities have been participated during the treatment. The clear juice is drawn off, while the sediment is filtered in so-called filter-presses. These apparatus extract a certain amount of clear juice which is added to the first product. The remaining refuse is removed from the factory.

Instead of this simple process a more complicated method is frequently used. According to this, the juice after having been

The up-to-date yard of a Java Sugar Mill pressed from the cane is mixed with a large quantity of milk of lime and treated at a low temperature with either carbonic or sulphuric acid till the lime is again neutralized. Then the juice is filtered and the cakes of residue thoroughly washed. In this way clear juice is obtained by filtration only and the boiling is obviated. The juice is then evaporated in vacuum pans by means of steam.

The syrup thus obtained is, after having been filtered, boiled in a vacuum in order that the sugar may crystallize. After this has been done the crystals are freed from the adhering molasses by means of centrifugals. These so-called first molasses are again boiled and the remaining sugar is extracted. The remaining exhausted molasses are removed.

A great deal of thought and rouble has been spent in order to link these various processes together and to make them into a harmonious whole. But even now a great deal of care has to be exercised in making preparations for the "campagne," i.e., the milling season, for a hitch or an interruption means a serious loss.

For many years previous to this, a small quantity of white sugar had been manufactured in Java for home consumption, but the production of this article for the purpose of exportation started only in 1903, in which year a shipment of 1,000 tons was sold to British India. The attack on the British Indian market proved a great success, the sugar found ready buyers and very soon Java began to manufacture white sugar in big quantities. This, of course, caused a great revolution in the working of the factories. After experimenting for a short time, they succeeded in producing a faultless white product without incurring greater expense than that which is entailed by the manufacture of muscovado. Java sugar, therefore, became more and more popular in British India and when, in 1911, the German sugar crop failed on account of great drought, white sugar was also shipped to England. The importation of white sugar from Hongkong into British India has almost entirely stopped and it is now only Java and Mauritius which supply the requirements of the great Indian empire so far as its own production is unable to meet the demand. Besides British India, also Japan, Hongkong, Australia, Singapore and several European countries buy Java sugar. The first named buys chiefly white sugar, the others raw sugar and by-products.

The great increase in the production of sugar per unit of area and the improvement of the quality of the article have, of course, not been brought about without the investing of a very large capital. The more intensive cultivation of land, the method of seed supply, the disinfecting, the manuring, the means of transport and locomotion, the machinery for the manufacture itself, the careful surveying and the constant chemical control and scientific investigations have increased the expenses per acre considerably, whereas the wages of the native laborers have, especially during recent years, materially risen. Notwithstanding this, the average first cost of a ton of sugar in Japan can easily compete with that of other producing countries in the world.

The following table gives the acreage under cane, total output of sugar, as well as the output of sugar per acre in Java during the years 1900 to 1920:—

| Year. | Acres under cane. | Sugar production in tons | Pounds of sugar per acre. |
|---|---|---|---|
| 1900 .. .. | 224,300 | 732,500 | 7,380 |
| 1905 .. .. | 260,500 | 1,022,800 | 8,779 |
| 1910 .. .. | 312,600 | 1,254,600 | 9,034 |
| 1913 .. .. | 360,400 | 1,436,600 | 9,006 |
| 1916 .. .. | 388,900 | 1,597,200 | 9,208 |
| 1919 .. .. | 340,100 | 1,309,400 | 8,626 |
| 1920 .. .. | 385,700 | 1,513,000 | 8,834 |

A fact which is not apparent in studying these figures, but which is still of great importance when judging results, is that the quality of Java sugar has materially improved during the last fifteen years or so, and is at present of much greater commercial value than formerly when the new and expensive, but splendid efficient methods of manufacture were not yet being employed.

The above story of the Java sugar industry would be incomplete without some reference to the fact that this industry proves a real blessing to the island. It gives work to hundreds of thousands of laborers, enables railways and trams to run at a profit, calls to life numerous smaller industries, such as lime kilns, brick works, machinery shops, manufactories of household articles, and in short spreads a vigorous life over the entire country. One of the great boons is undoubtedly the encouragement given to railways and tramways. For, not only do they connect the centres of supply with those of demand, but the natives are also given a chance of visiting other parts of the country and, by drawing comparisons, learn a great real. The result has been that instead of being content to live in primitive dwellings and to have few wants, we now meet with many natives who have higher aspirations and, what is even better, the means of satisfying them.

For the European, whether he has been born in Java or whether he has immigrated, the sugar industry reaps many a benefit. The 183 factories which were working in 1920 employed over 3,000 Europeans, most of whom are married men with families. They enjoy good salaries, besides, in many cases, receiving in addition yearly gratuities. On account of the fact that successful men retire early and on account of constant vacancies occurring through men going on home-leave, promotion is rapid and there are few professions in which a young man, without money or influence, can so soon reach a lucrative position and in which he may with capacity, zeal and common sense reach the highest ranks without being obliged to invest even the smallest sum. Above all, however, it is necessary to acquire a good education as an agriculturist, an engineer, a chemist or a mechanician.

The figures below show the total exports of Java sugars during recent years :—

| | Quantity in metric tons | | | |
|---|---|---|---|---|
| | 1915 | 1918 | 1919 | 1920 |
| Superior white sugar | 1,142,490 | 1,504,480 | 1,841,713 | 1,483,223 |
| Raw sugar .. .. | 62,546 | 33,975 | 19,969 | 21,643 |
| Molasses .. .. | 165,696 | 34,110 | 132,697 | 178,153 |

* * *

Japan's shipbuilding industry during 1921 was much more depressed than in 1920. As against 93 ships, of 433,000 tons, built in 1920, only 42 ships, of 217,000 tons, were constructed last year, which is a decrease of 51 in number and 216,000 tons. The following figures show the number and tonnage of ships launched at principal shipbuilding yards and dockyards in Japan last year :—

| | Number. | Tonnage. |
|---|---|---|
| Osaka Steel Works .. .. .. | 9 | 30,850 |
| Mitsubishi Dockyard .. .. .. | 6 | 43,390 |
| Kawasaki Dockyard .. .. .. | 7 | 44,460 |
| Yokohama Dockyard Co. .. .. .. | 5 | 31,820 |
| Asano Dockyard .. .. .. .. | 3 | 19,350 |
| Kobe Steel Works .. .. .. .. | 2 | 10,400 |
| Mitsui Dockyard .. .. .. .. | 2 | 11,000 |
| Uraga Dockyard .. .. .. .. | 1 | 2,200 |
| Toba Shipbuilding Yard .. .. .. | 1 | 3,000 |
| Nitta Shipbuilding Yard .. .. .. | 1 | 3,800 |
| Fujinagata Shipbuilding Yard .. .. | 1 | 3,750 |
| Uchida Shipbuilding Yard.. .. .. | 1 | 5,700 |
| Ishikawajima Shipbuilding Yard .. .. | 1 | 5,600 |
| Ono Steel Works .. .. .. .. | 1 | 1,300 |
| Total .. .. .. .. | 42 | 217,220 |

# River Conservancy in China

*By Lawrence Impcy, Assoc. M. Inst. Mun. & County Engrs.*

**Chief Engineer, Sze Tze Kow Conservancy Scheme**

IN the year 2297 B.C. occurs the first flood of which the history of China takes note, when the Yellow River or Huang Ho, sometimes known as "China's Sorrow," overflowed its banks with most disastrous results.

The dual rulers of the middle kingdom, Yao and Shun, called into counsel the famous Yu, as being the only person competent to deal with the disaster, and it is recorded that after eight years of unremitting labors, during which he never left his duties for so long a period as to enable him to visit his home and parents, Yu was successful, and the waters were drained off into specially constructed rivers and canals.

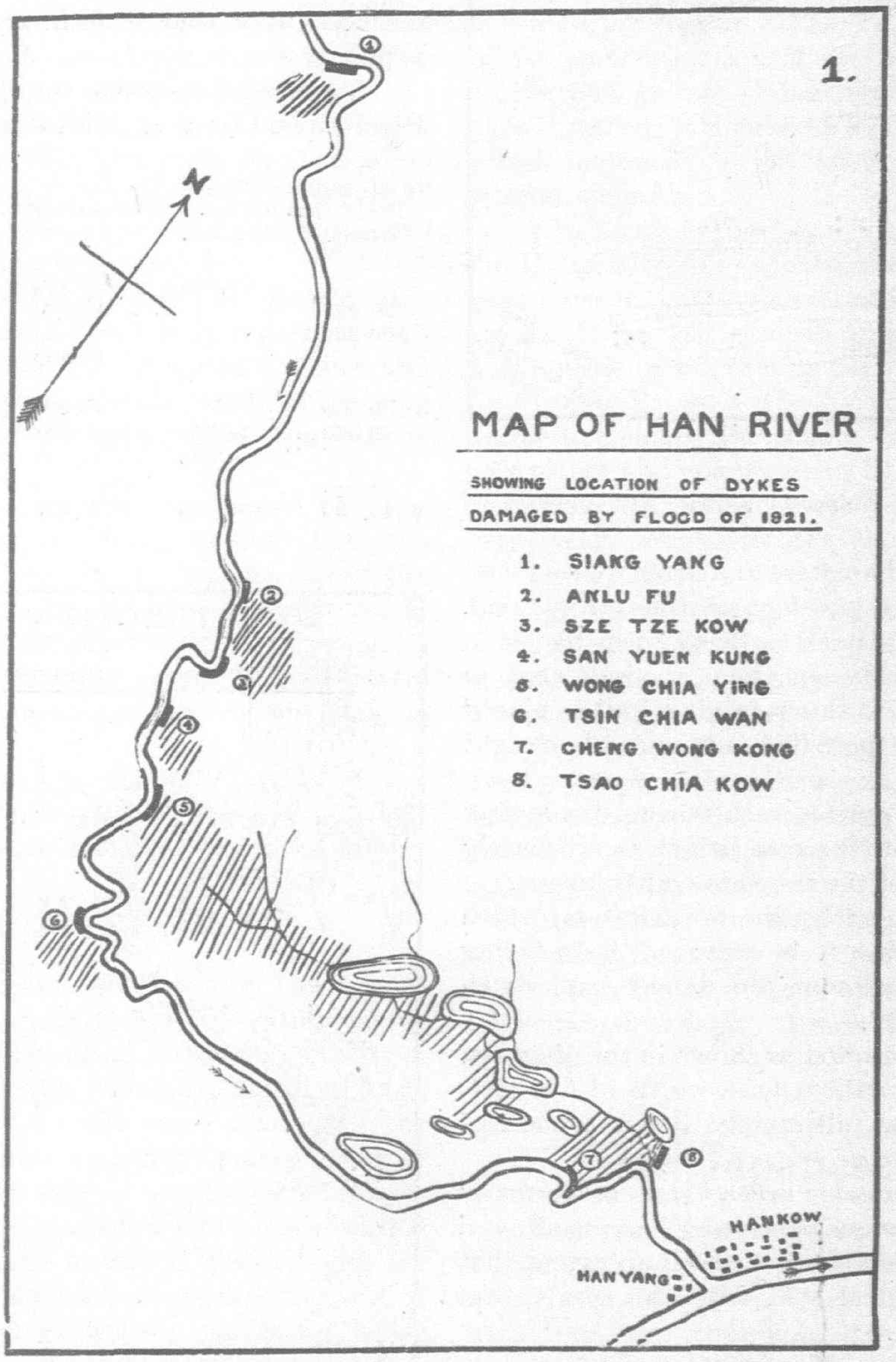
This, I believe, is the first record of conservancy work which history can show, and is certainly one of the finest in its achievements.

From that day to this the history of China has been marred by the record of a succession of floods on the part of the Yellow River, the Yangtze, or the Wei Ho, or the Han River, and it is this question to which I would ask you to give a moment's thought.

For purposes of illustration I propose to deal with the course of the River Han, which flooded the country on both sides of its channel during the autumn of 1921, and with which we are now endeavoring to cope.

The first point to be noticed is the unusual length of the rivers of China, and the consequent volume of water accumulated from their watersheds.

The flooded territory, shown on the accompanying map as shaded area, does not appear so extensive, until it is realized that the distance from the first point at Siang Yang, to the junction of the Han and the Yangtze at Hankow, is a matter of three hundred miles.



Furthermore, the volume of water which caused such distress was accumulated over the whole course of the river, a distance of over two thousand miles, the greater portion of which has been explored by but two or three foreigners at the most, and concerning which no statistics are available.

It should be realized also that owing to the small scale of the map on Sheet 1 it has not been possible to indicate the numerous bends in the course of the river, which has in reality a far more tortuous channel, the boats going up stream pointing their prows first west, then north, then east, and probably west again, which renders navigation by the use of sails a matter of extreme difficulty.

As you can see, by referring to the section on Sheet 2, the water level of the river varies over twenty feet during the rainy season, and the pressure exerted by the increased volume of water is enormous.

Owing to the angles in the channel it often happens that two or three miles of flood water makes a direct assault on some particular portion of the dyke, with what results it is easy to imagine.

In the first place, although the dyke is faced with stone in some places, it has no foundation, with often a very sharp angle of entry to the river, and therefore, even in the less dangerous portions, the damage caused by erosion is very great.

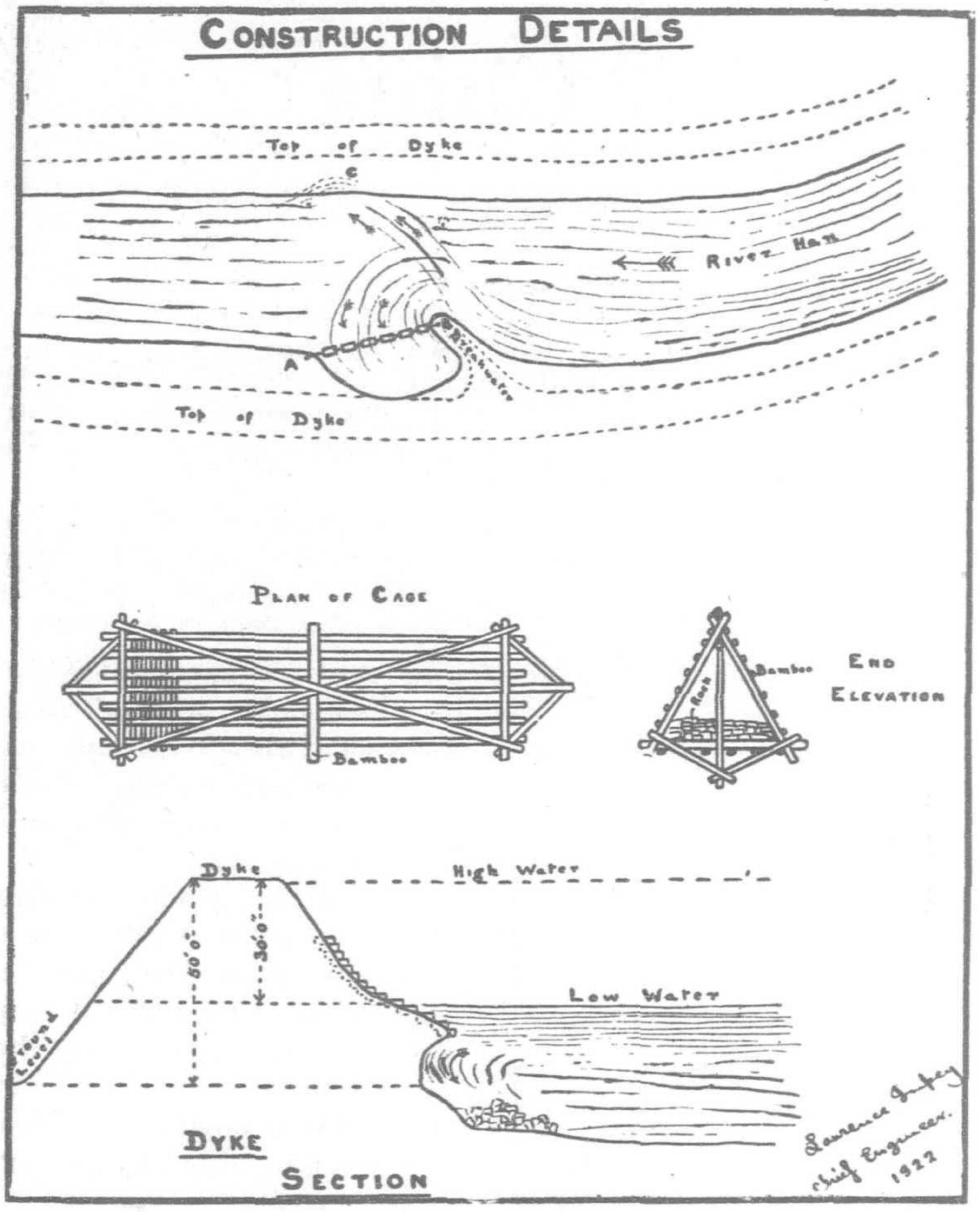
The Chinese of the past few generations have developed a system of so-called 'breakwaters' as shown in the plan on Sheet 2, with the effect which is shown by the arrows on the sketch.

The angle to the current varies from forty-five degrees to a right angle, and the water attacks the opposite shore, washing away large areas of land, and also, forming a curious eddy, destroys the dyke immediately behind the breakwater, as illustrated in the plan, which is drawn from my survey of an actual site.

I am unable to discover why the Chinese are so attached to this form of construction, but from observation of the breaks in various parts of the river, I am unable to see anything to recommend it as an engineering theory.

These remarks apply with equal force to those portions of the Yellow River, the Wei River, and the Yangtze, which I have seen, but I should be only too pleased if any of my readers with greater experience would supplement my suggestions and comments.

The methods which we are adopting will not commend themselves to experts, doubtless, who will cry out at the lack of foundations for construction, and the smallness of the piles, and the absence of cement facing, but I can only say in excuse



that the time and funds at our disposal would not permit of this form of construction.

The piles used are 9-in. in diameter, and from twenty-two to thirty feet in length, placed at two feet centres for spacing, and having a penetration of from fifteen to twenty-two feet.

Stout bamboos are woven between them, as indicated in the diagram on Sheet 3, and behind this retaining wall is placed the broken rock, to a thickness of three feet, and a depth of eight feet.

The piles are tied back by quarter inch wiring, made fast to a base pile some twenty feet in the rear, which is ultimately buried in the earth by the depth of the re-made embankment.

With regard to the bays caused by the breakwaters, which the Chinese at present will not allow to be removed, I am trying a cheap experiment which may overcome the danger, and which I have sketched roughly on Sheet 2.

Bamboo cages are being constructed as shown in the diagram, some twenty feet in length, and with a base width of five feet, the construction being such that ultimately it has a mesh of about an inch.

The theory is that of the permeable breakwaters of Germany and Holland, which permit of the passage of water bearing alluvial deposit, but which slow the current down to such an extent that it is forced to relinquish its burden of soil, with the result that the breakwater gradually silts up.

This method of passing a chain of cages from Station A to Station B is an experiment, as there is very little data available as to the results of such a theory in other countries, if, however, it prevents scouring, it will more than repay its cost.

With regard to the methods of construction work I can only say that they are extremely primitive, which statement I will support with a few illustrations.

The piles are pushed into the muddy bottom of the river by the united efforts of some half-dozen coolies, and when this result has been achieved they then erect a sort of frame on the pile itself, which they slip up to within three feet of the top, and which by some species of miracle remains there, and what is more, supports the gang, who proceed to balance on this precarious platform and with the aid of a circular stone, weighing fifty pounds or so, they pound the said pile into the ground, sinking gradually with it themselves.

Earthwork is paid by the *fong*, or one hundred cubic feet, and the natives bring the dirt to the site in carrying baskets, wheel-barrows, bullock carts, and various other means of conveyance.

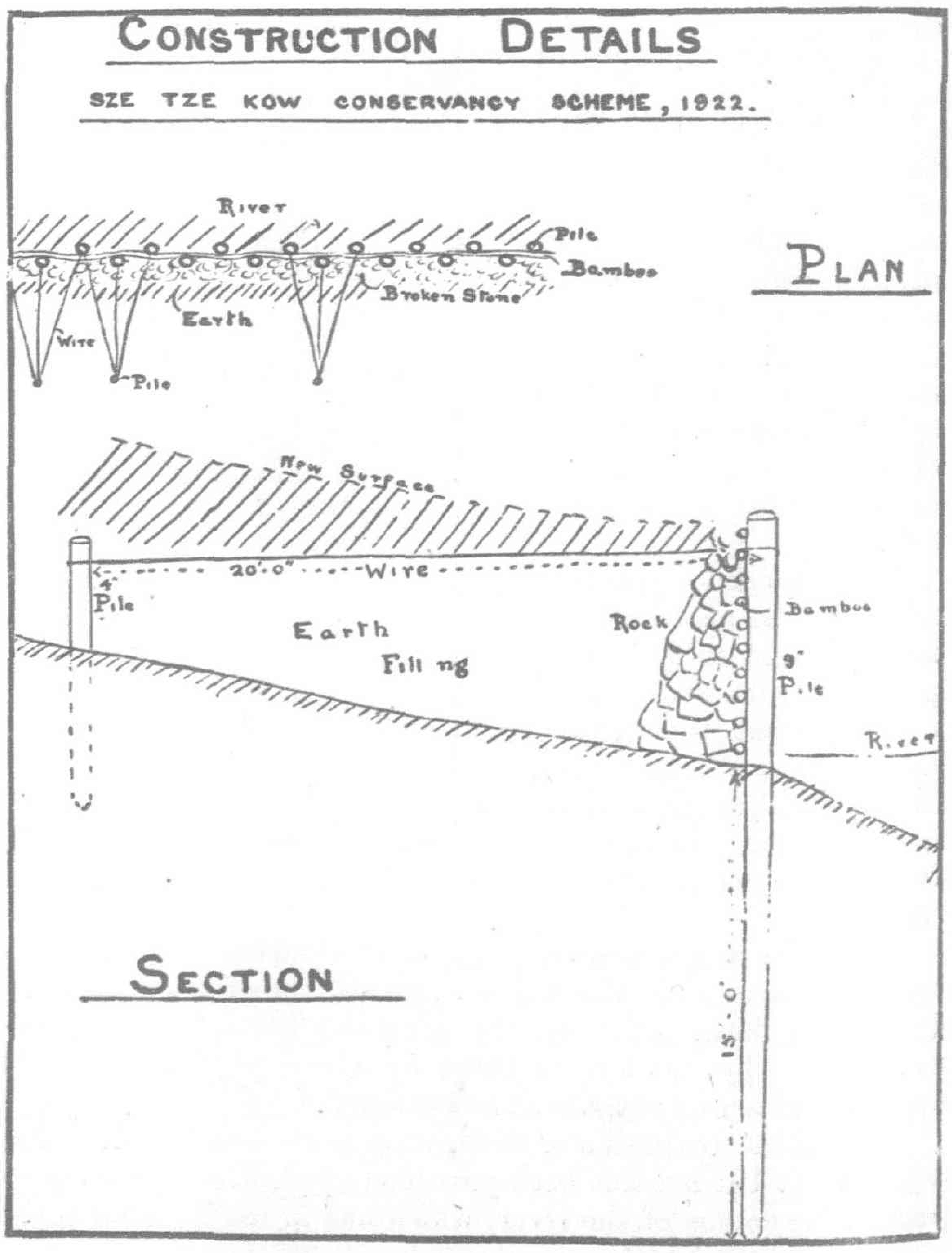
The foreman gives each worker a bamboo slip for the load deposited, and when ten such slips have been accumulated they can be exchanged for another representing that amount of work, until at the end of the day all slips are redeemed in cash.

The cost of driving a pile may be said to average half a dollar each, and the price per *fong* of tamped earth is a little above or below one dollar, according to the distance of haulage.

I estimate that the laborers on our work can earn from three hundred and fifty to four hundred and fifty cash a day, which enables them to live on until the harvest is due, for it must be remembered that most of the labor is famine labor due to the flood, and that in ordinary seasons prices will naturally be higher.

I append hereunder the figures of expenditure on the Han River work this year, allocating each to its particular source :—

| International Famine Relief Committee. | | Local Subscription. | Government Grant. | Location of Work. |
|---|---|---|---|---|
| Grant. | Loan. | | | |
| $ | $ | $ | $ | |
| | 10,000 | 10,000 | | Siang Yang. |
| 20,000 | | 40,000 | | Anul Fu. |
| 50,000 | | | 50,000 | Sze Tze Kow. |
| | | 10,000 | 20,000 | San Yuen Kung. |
| | | | 1,200,000 | Wong Chia Ying. |
| 60,000 | | 40,000 | | Tsin Chia Wan. |
| 10,000 | 10,000 | 20,000 | | Cheng Wong Kong. |
| | 10,000 | 10,000 | | Tsao Chia Kow. |
| $140,000 | $30,000 | $130,000 | $1,270,000 | |



With regard to the work at the government section at Wong Chia Ying, after examination of the site, in company with two or three competent engineers, Chinese and otherwise, we came to the conclusion that the work was extremely slipshod, unsound in theory, and so high in cost compared with results as to be out of all proportion.

On further investigation I found that there was no qualified engineer on the work, that there were some twenty different departments, none of whom were collaborating, and some of whom did not seem to be responsible to even one central authority.

The authority was vested in a very estimable odl man, who was very seldom on the spot, as far as I could tell, the recommending factors in his favor were old age, good disposition and vegetarianism; probably he came from the home town of some one in authority.

At all events there was a wonderful system of overseers and foremen, all of them taking a little 'squeeze,' and then delegating the job to others, so that it was almost impossible to discover who was really responsible for any particular piece of work.

The work being undertaken at Tsao Chia Kow varies from the rest, in that it consists of the construction of a canal, to drain some of the flooded areas back into the river, a work which might be very largely extended if funds and time permitted.

In spite of all the repair work which has been and will continue to be done, the river gains ground, and shifts its channel, as do all the other rivers of China, leaving in their wake a desert of sand on which nothing can be grown, and aptly pointing the moral of the title of the Huang Ho, 'China's Sorrow.'

The only real solution of the difficulty lies in the straightening of the channel, and the constant use of dredgers, though it is possible that the narrowing of the limits and direct and rapid course of the river would also achieve the result of scouring the channel, and obviate much of the repair work which is at present necessary.

It is an interesting comment on the importance of river navigation and conservancy work in China, to note that the first conservancy engineer in Chinese history became one of the first emperors of the middle kingdom, one of the famous rulers of the golden age, and the saying attributed to Yu, in which he gives the secret of his success, might well be inscribed in letters of gold, for our modern scientific knowledge can add but little to it:—

"Keep the channel straight and its bottom clear."

## Silk Mills in Hangchow

HANGCHOW, the provincial capital of Chekiang, is a famous silk-producing centre with several mills operating along modern lines. The most important of these are:

**Wai Cheng.**—The Wai Cheng Silk Weaving Factory, Ltd., established in 1912, and registered in the same year with the ministry of agriculture and commerce, under the management of Mr. Chu Kwang-shou. The main factory is situated at Shaw-chi-tang-hong, Hangchow, with a branch which is under construction at Dah-yen-chong-jao, Kashing. The former is divided into six departments, viz.: hand-weaving, design, adjusting, twisting, reeling and dyeing, employing about 1,700 workmen; the latter, when completed, will have four departments, viz.: power-weaving, twisting, adjusting and reeling. The yearly output is valued at over $1,200,000.

**Hoo Ling.**—The Hoo Ling Silk Textile Plant, Ltd., founded in 1912, is located at Poo-chang-hong, Hangchow. The factory has three departments, viz.: weaving, design and adjusting. It employs about 1,300 workmen turning out an annual production of about $700,000 in value. A branch plant, consisting of reeling and twisting departments, has been recently erected. Mr. Tsai Ching-yen, graduate of the Dyeing and Weaving College at Tokyo, is general manager.

**Yuen Tseng Woo.**—The Yuen Tseng Woo Silk Weaving Factory at Hsiao-foo-ching-hong, Hangchow, was founded many years ago. The factory consists of the winding, twisting, reeling, design and is equipped with 200 looms and employs more than 1,600 employees. It is capable of turning out a yearly production valued at $600,000. Mr. Yuen Chiar-tseng is proprieter and manager.

**Tien Chong.**—The Tien Chong Silk Weaving Factory at Pu-chiar-lung, Hangchow, was registered with the ministry of agriculture and commerce in December, 1920. It consists of six different departments, viz.: reeling, winding, weaving, twisting, figuring and power rooms and has 600 employees at work. The production of the factory amounts to about $350,000 in value every year. Mr. Chow Ching-yuen is general manager.

**Ching Cheng.**—The Ching Cheng Silk Weaving Factory at King-dong-jao, Hangchow, was registered with the ministry of agriculture and commerce in March, 1913. The factory is divided into four departments, viz.: weaving, figuring, winding and dyeing and employs 410 workmen. Its general manager is Mr. Hsu Yih-ching, and its annual output is 4,000 pieces of satin valued at $240,000.

**Yu Chong Wen.**—The Yu Chong Wen Silk Weaving Factory in the eastern section of the city was founded and registered at the end of late Ching dynasty, in 1912, 170 modern looms were installed. At present there are 400 employees and its yearly output amounts to $300,000 in value. Mr. Chiu Yih-yung is general manager.

**Kiu Chen.**—The Kiu Chen Silk Weaving Factory at Wu-foo-liu, Hangchow, was registered with the ministry of agriculture and commerce in 1914, under the management of Mr. Wang Hsiao-ching. It has 130 looms in operation and 370 workmen, producing 4,600 pieces of silk fabrics per year valued at $240,000.

**Tseng Foong.**—The Tseng Foong Silk Weaving Factory at Ching-lung-chiar, Hangchow, was registered at the ministry of agriculture and commerce in 1914. There are 120 looms and 330 employees. It produces silk fabrics to a value of about $240,000 every year. Mr. Chen Mow-ching is general manager.

**Lung Chong.**—The Lung Chong Silk Weaving Factory at Hwang-tsoo-yuen-hong, Hangchow, was established in 1917, and is managed by Mr. Kao Pang-nien. It is equipped with forty-two modern looms and employs 180 workmen, with an annual output of about $120,000 in value.

**Sui Sing.**—The Sui Sing Silk Weaving Factory, located at Teng-yuan-jao, Hangchow, was organized in July, 1915. The factory has two departments and employs 180 workmen with an annual output of about $130,000 in value. Mr. Shen Yao-foo is its general manager.

**Dah Sing.**—The Dah Sing Silk Weaving Factory at Chang-ching-chiar, Hangchow, founded in 1915, is run under the direction of Mr. Chen Tze-an. It has about 100 looms in operation, and keeps 180 workmen at work. Its yearly output is approximately $120,000 in value.

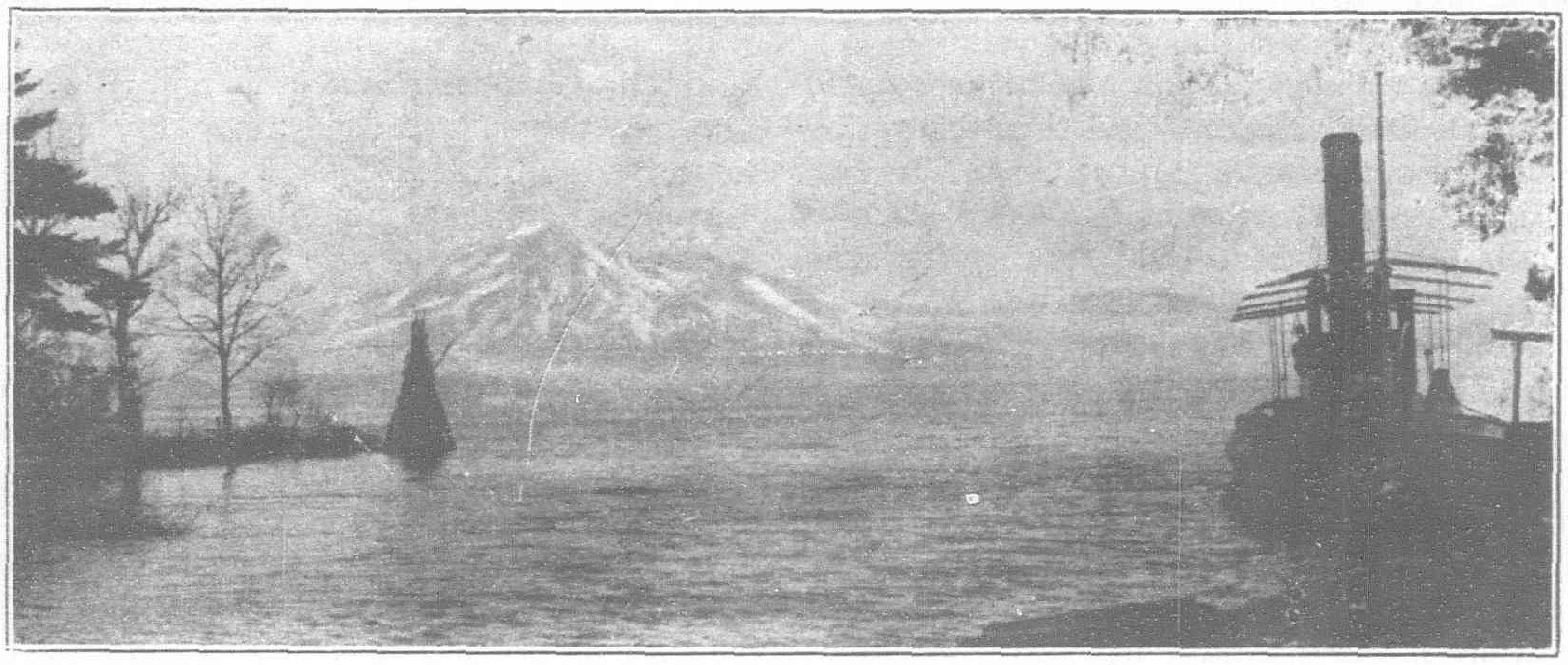
## The Japanese Soap Industry

The value of the soap produced in Japan in 1908 amounted to Y.3,040,000. In 1918, ten years later, it attained Y.20,940,000, of which Y.10,490,000 were for toilet soaps. In 1918 Japan had 277 soap factories, employing 2,988 hands. In 1919 there were exported Y.3,000,000 worth of toilet soap and Y.500,000 worth of household soaps, while Y.3,600,000 soap were imported from abroad, chiefly from England and the United States. The requirements of caustic soda and carbonate of soda are covered by the leading Japanese soda-producing districts. English and American sodas are not so dear, however, so that Japanese manufacturers are not clamouring for customs discrimination to be made against them. In 1920 a new soap and candle factory was founded, under the style and title of the "Japan Soap Manufacturing Co."; it will work chiefly for exportation, similar to the already existing "Nippon Glycerine Manufacturing Co."

# Japan's "Water Powers"

## The Inawashiro Hydro-Electric Power Company, Ltd.

AS far back as 1896, the North-Eastern Electric Power Company and the Japan Hydro-Electric Power Company had been promoted for the purpose of utilizing the flow of the Nippashi River for the generation of electric power, their plans, however, being confined to obtaining water rights on the river itself, overlooking the more important source of power confined within Lake Inawashiro. In 1910, their rights were taken over by the promotors of the Inawashiro Hydro-Electric Power Company, Ltd., after which negotiations were entered into for acquiring the rights of the Asaka Irrigating Association, who obtained in 1878 the privilege of utilizing the waters of Lake Inawashiro for irrigating large tracts of rice lands in Asaka perfecture. With control of the lake as a storage reservoir, the new enterprise was placed on a secure basis, making possible the transmission of power to Tokyo, 140 miles away. In July, 1911, permission was granted by the ministry of communications to proceed with the plans. The first meeting of the shareholders of the new company was held on October 30 of the same year, in which the nominal capital was authorized at Y. 21,000,000, divided into 420,000 shares of Y 50 each. The company then secured the reservoir rights to Lakes Hibara, Onogawa and Akimoto which lie at a higher altitude than Lake Inawashiro, and then obtained rights to the Nagase River which serves as the outlet to the above lakes and empties into Lake Inawashiro.

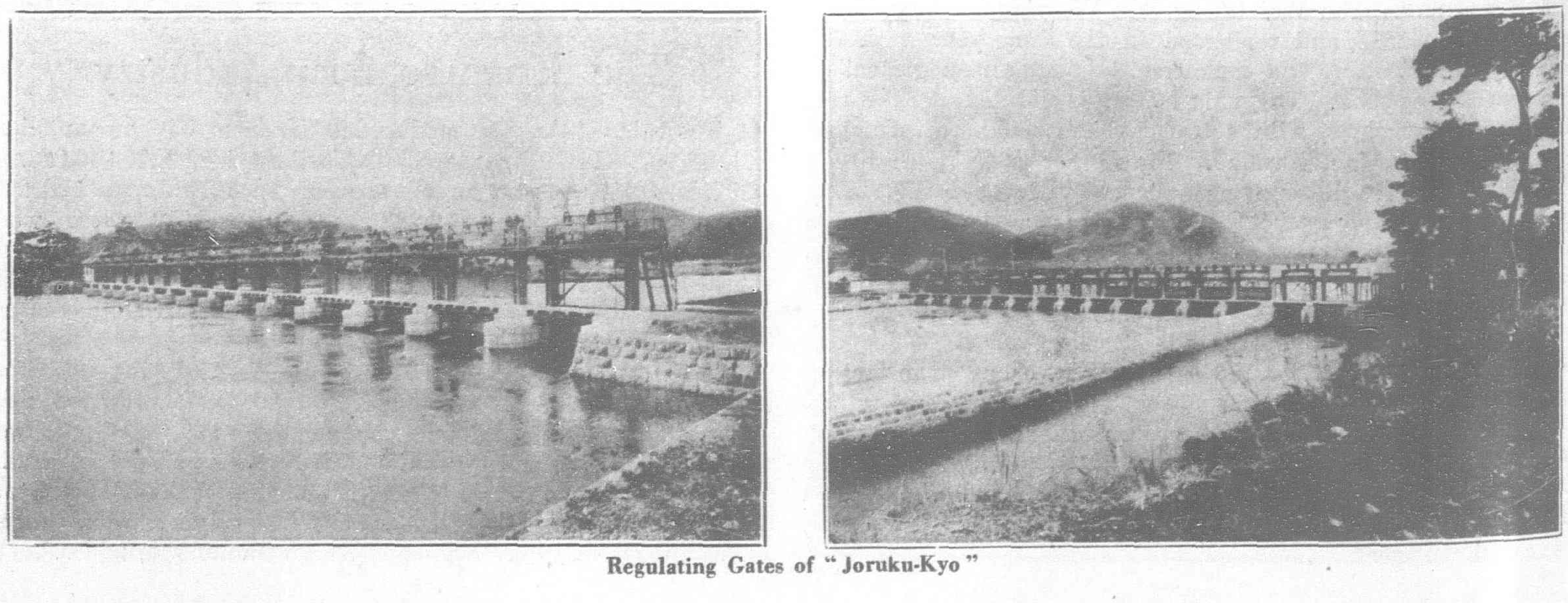


Lake Inawashiro

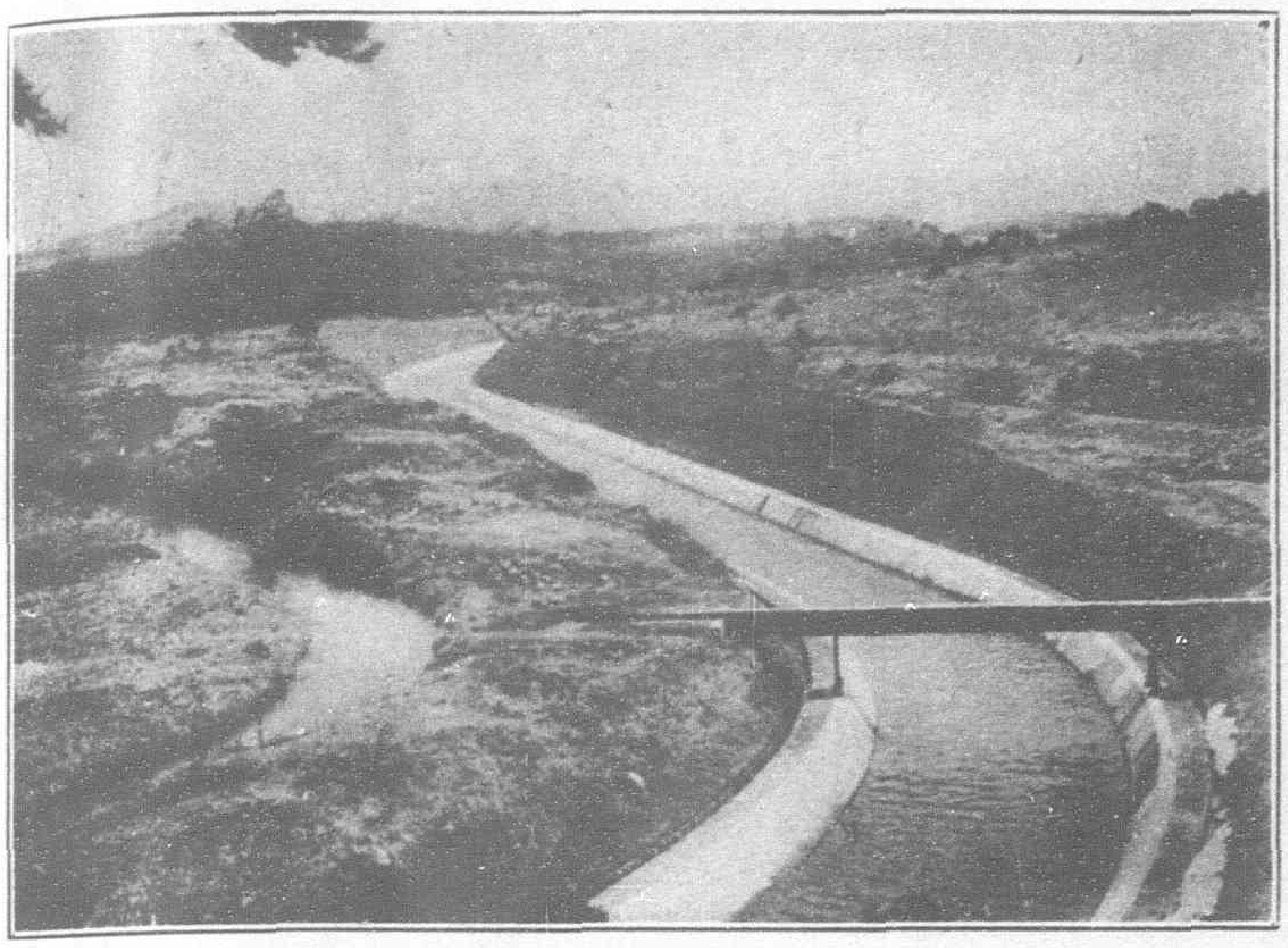
### General Plan

Lake Inawashiro, with nearly 42 square miles of water surface, drains an area of 319 square miles (including the Nagase River and other streams which empty into the lake). It has a depth of 3.2-ft. and a storage capacity of 3,500 million cubic feet. Its elevation is 1,700 feet above sea-level, or 1,000-ft. higher than the plateau of Wakamatsu. The Nippashi River flowing northeast is the only outlet to the lake and its drainage area. In the Wakamatsu plateau it joins the Ara River and empties into the Japan Sea. Four power houses are installed along the Nippashi River. According to the franchise granted by the government the quantity of water flowing normally in the Nippashi River is placed at 1,000 cubic feet per second, but by regulating the flow at the "Juroku-kyo" gates, a maximum flow of 1,600 cubic feet per second can be obtained, corresponding to a peak load of 62.5 per cent. load factor. Several irrigating canals located between power houses three and four decreases somewhat the quantity of water available for these plants.

Above Lake Inawashiro, are located three lakes, Hibara, Onogawa and Akimoto, connected by the Nagase River, and emptying into the larger lake. Lake Hibara with an elevation of 2,700-ft., has an area of about 4.1 square miles, draining a watershed of about 40 square miles. Its depth is about 43-ft. and its storage capacity about 4,200 million cubic feet. Lake Onogawa, is 2,620-ft. above sea-level, 0.6 square miles in area, draining about 55 square miles of territory, including that of Lake Hibara. Its depth is 29-ft. and its storage capacity,330 million cubic feet. There is a difference of 230-ft. in elevation between this lake and the next lake, Akimoto. Utilizing these two lakes as reservoirs, the Onogawa power house is to be installed. It is calculated that the maximum and mean yearly flow of water through this power house will be at least 485 and 315 cubic feet per second, respectively, the load factor being assumed as 65 per cent.

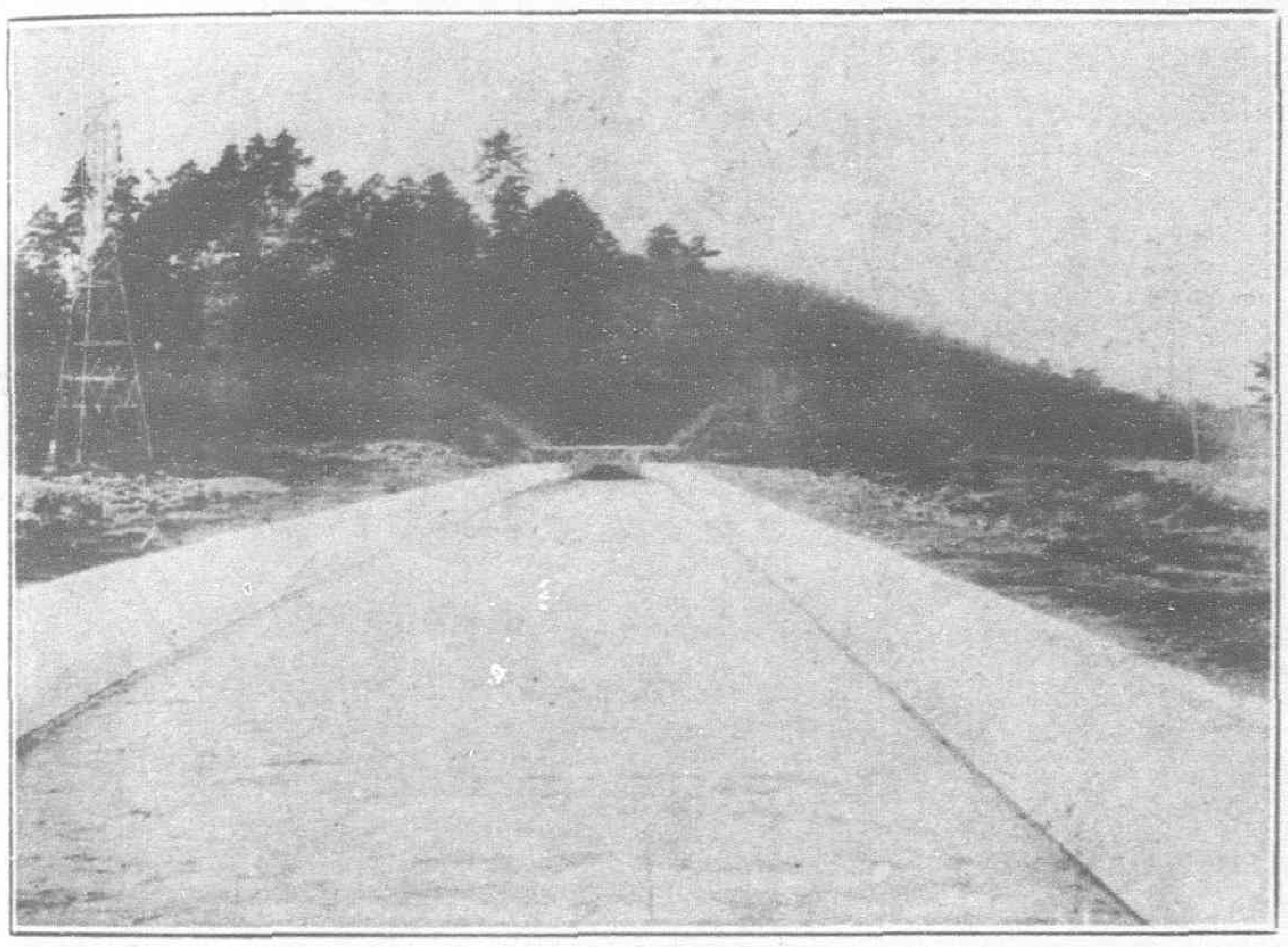


Regulating Gates of "Joruku-Kyo"

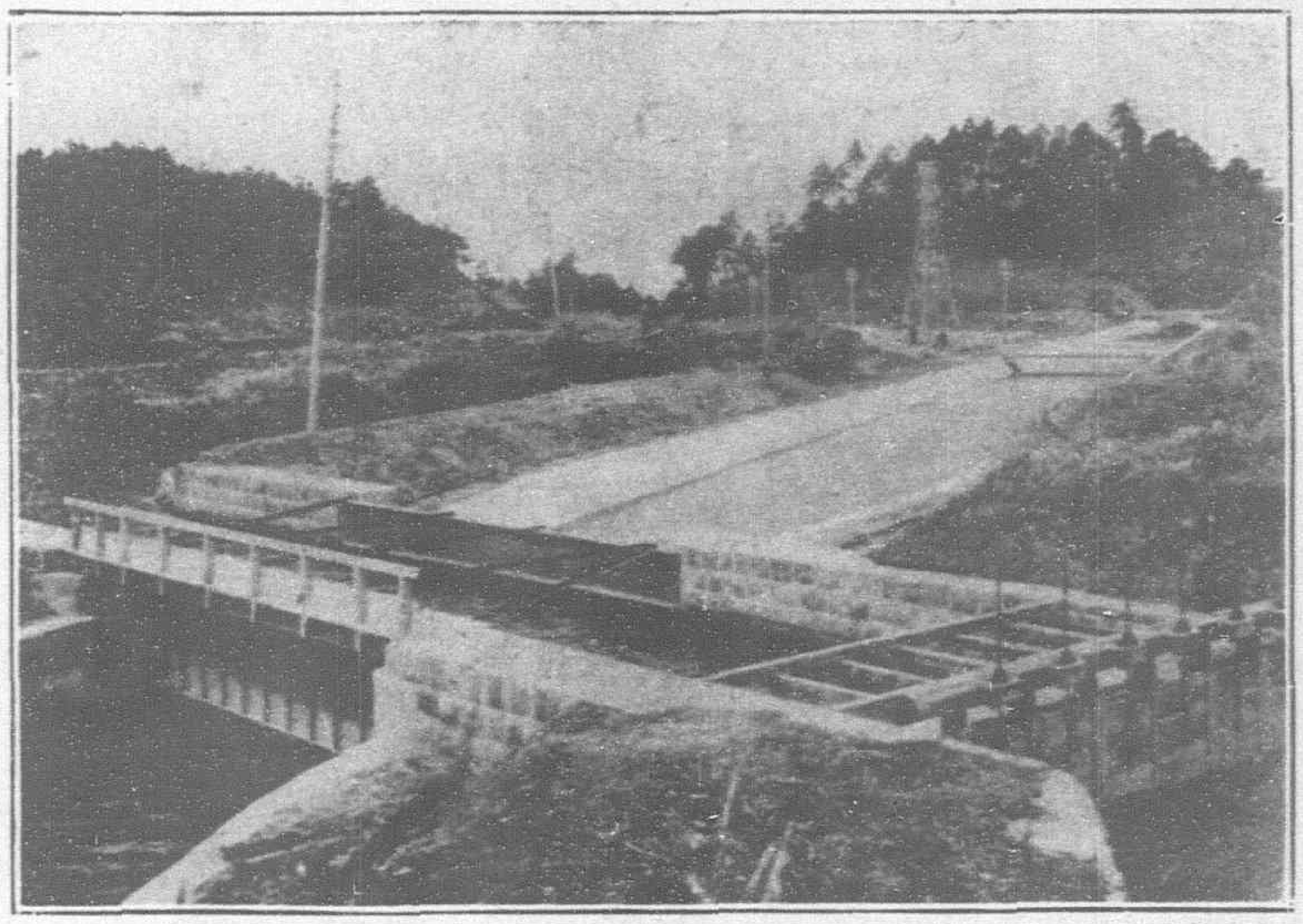


No. 1 Open Canal

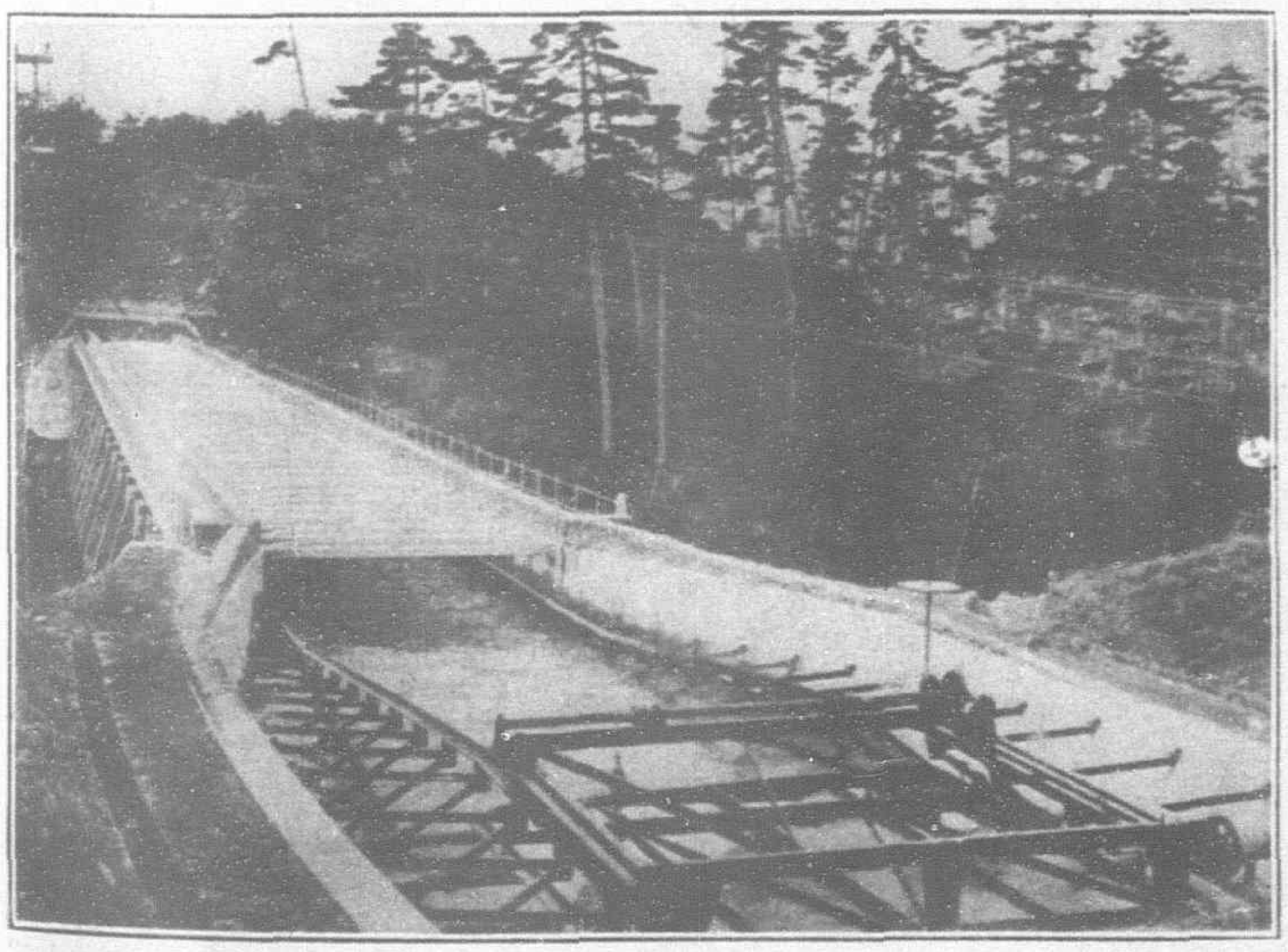
No. 1 Conduit



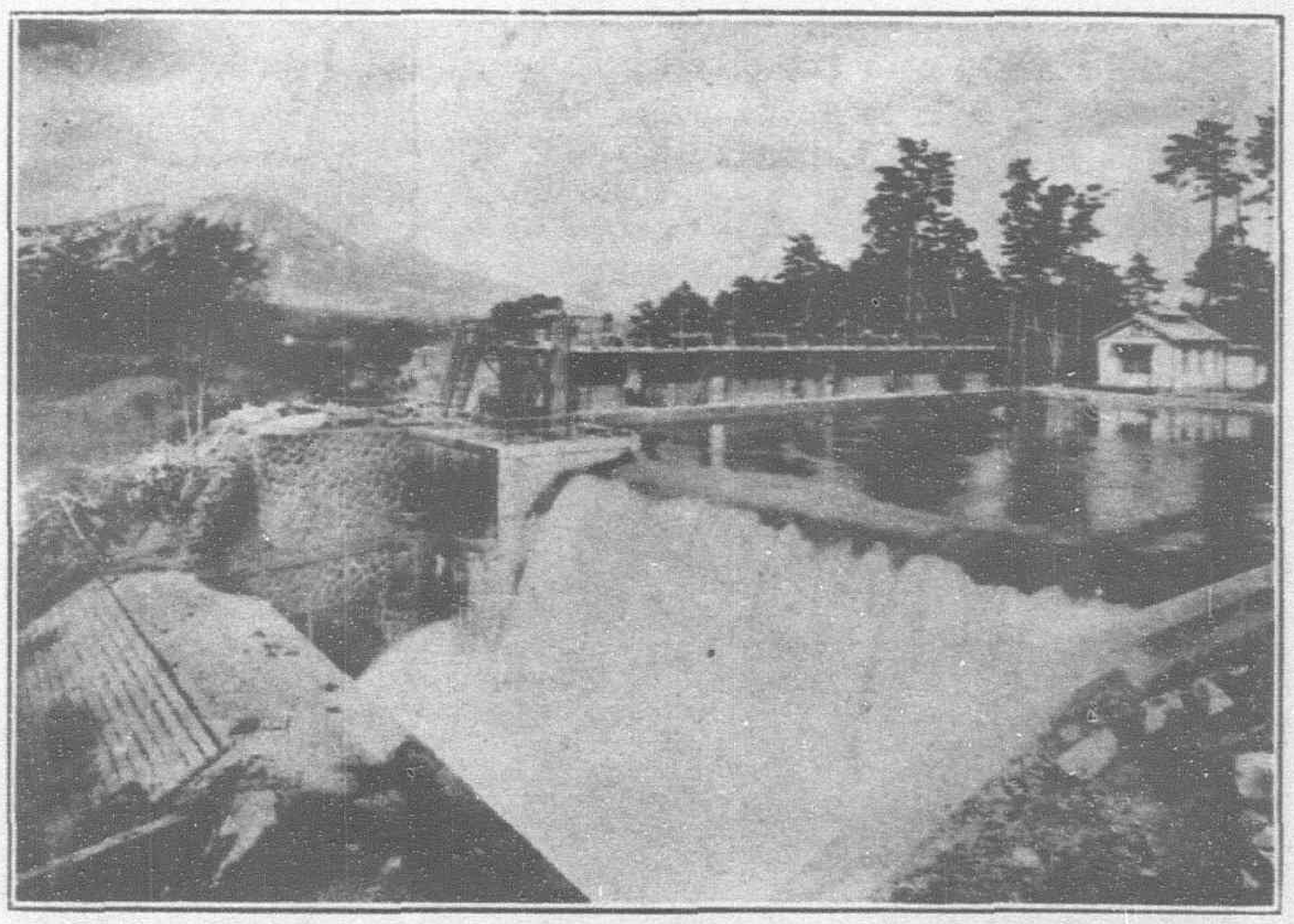
No. 1 Tunnel



Tonokuchi Irrigation Flume Crossing the Power Canal



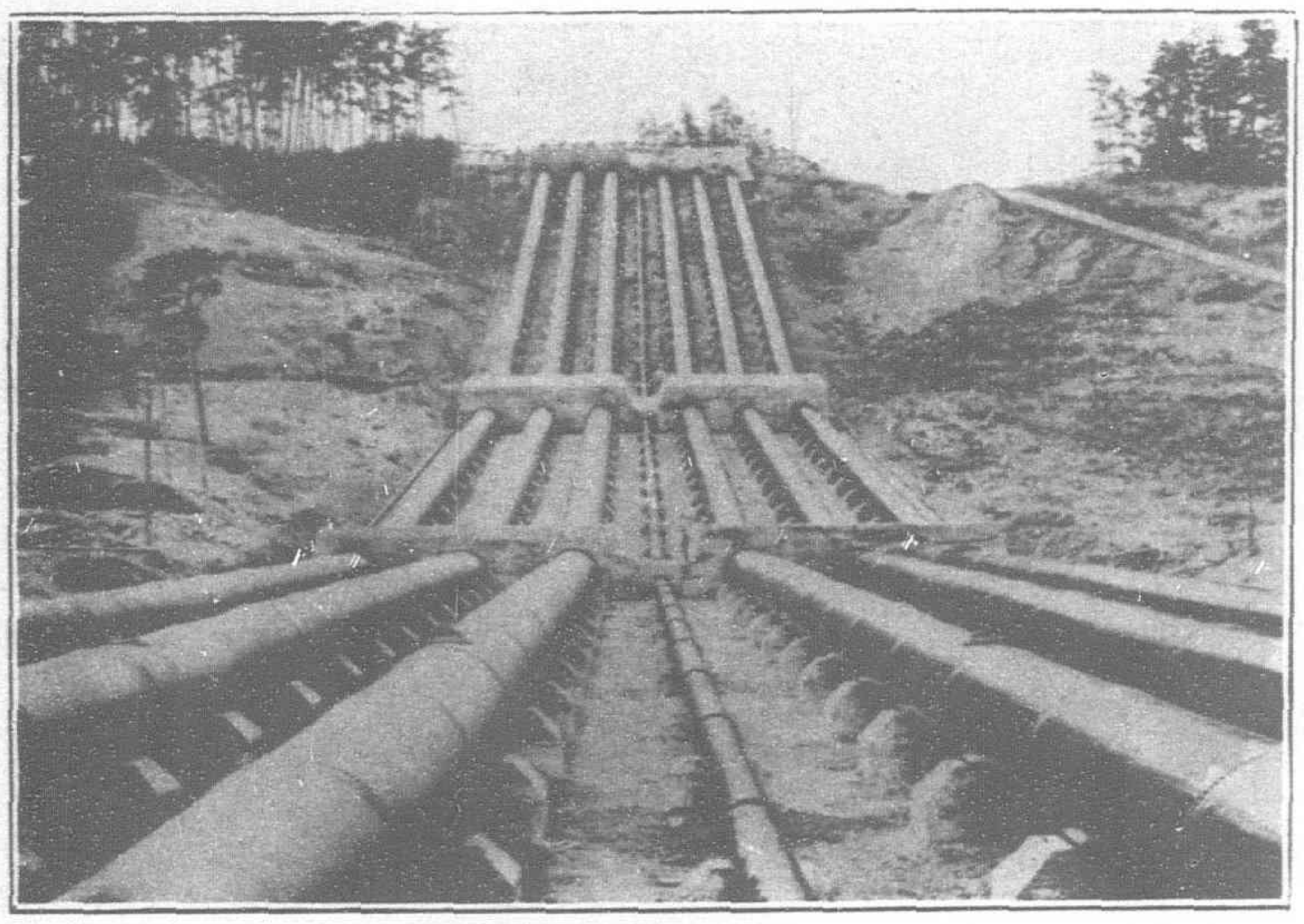
Aqueduct



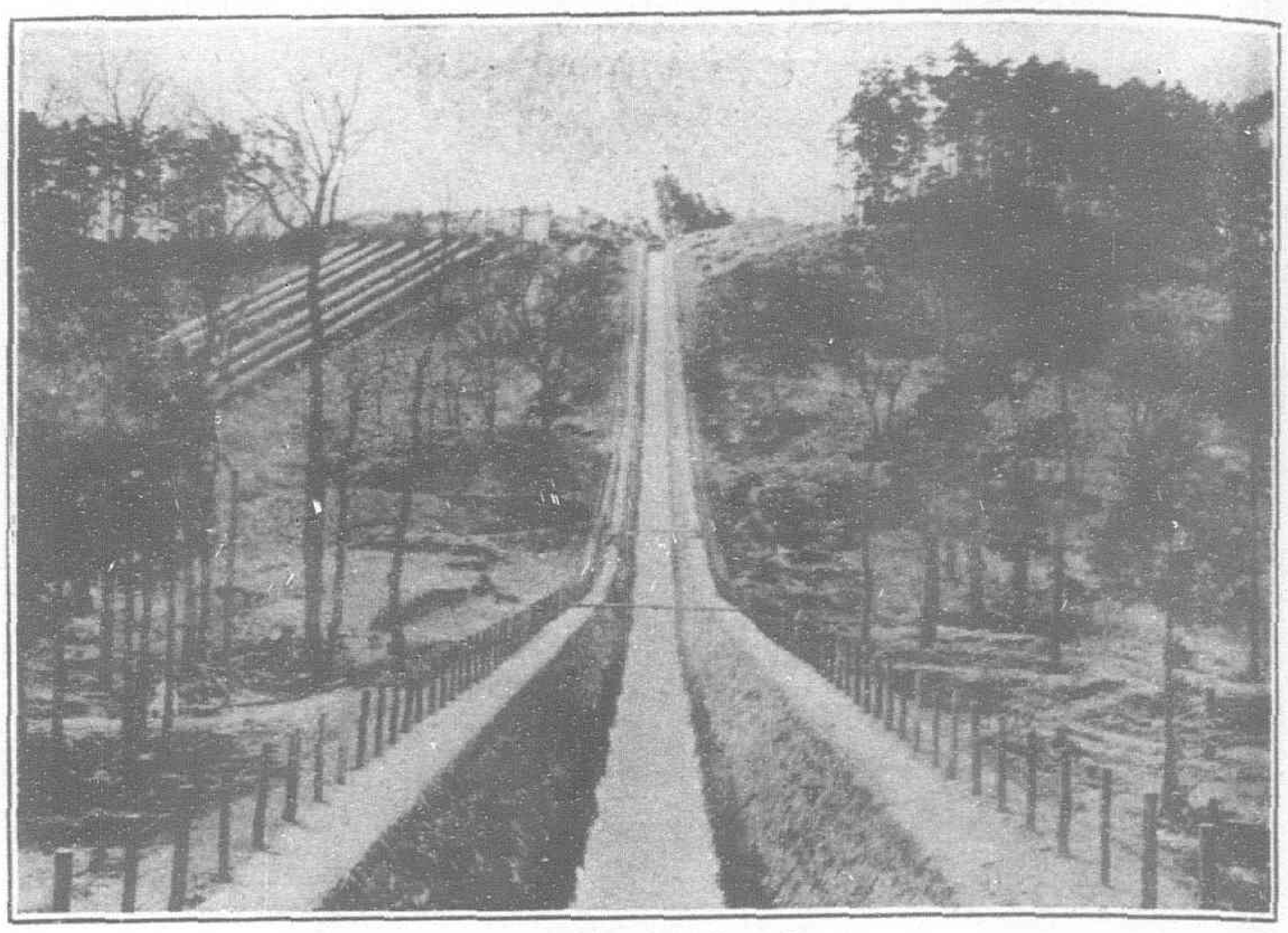
Head Tank

Lake Akimoto has an elevation of 2,390-ft. above sea-level, with a fall of 690-ft. to Lake Inawashiro. Its area is 1.2 square miles, draining a water-shed of about 42 square miles. Its depth is 39-ft. with a storage capacity of 1,100 million cubic feet. Between the two lakes are to be installed two power houses, the Kawakami power house for the upper section and the Myoka power house for the lower. By utilizing the three lakes as seasonal and daily regulating reservoirs, the maximum and mean flows through the Kawakami power house throughout the year are calculated to be 897 and 583 cubic feet per second respectively, the load factor being assumed at 65 per cent. A descrease in the water for the Myoka power house is necessary because of the existence of some irrigating canals above its site.

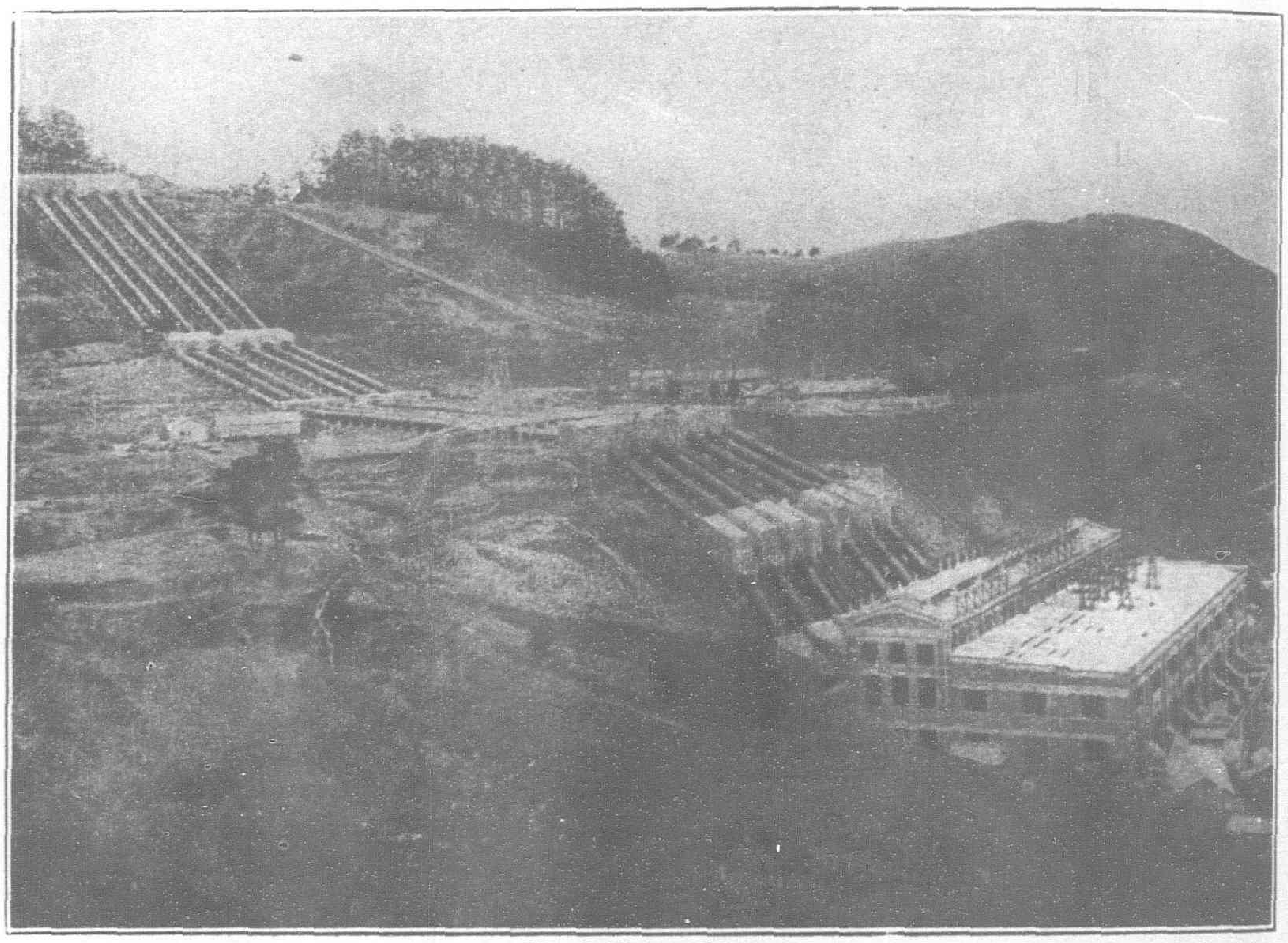
The following table shows mean effective head, maximum quantity of water and corresponding theoretical horse-power for the respective power houses.



Pressure Pipe Lines



Spillway Canal



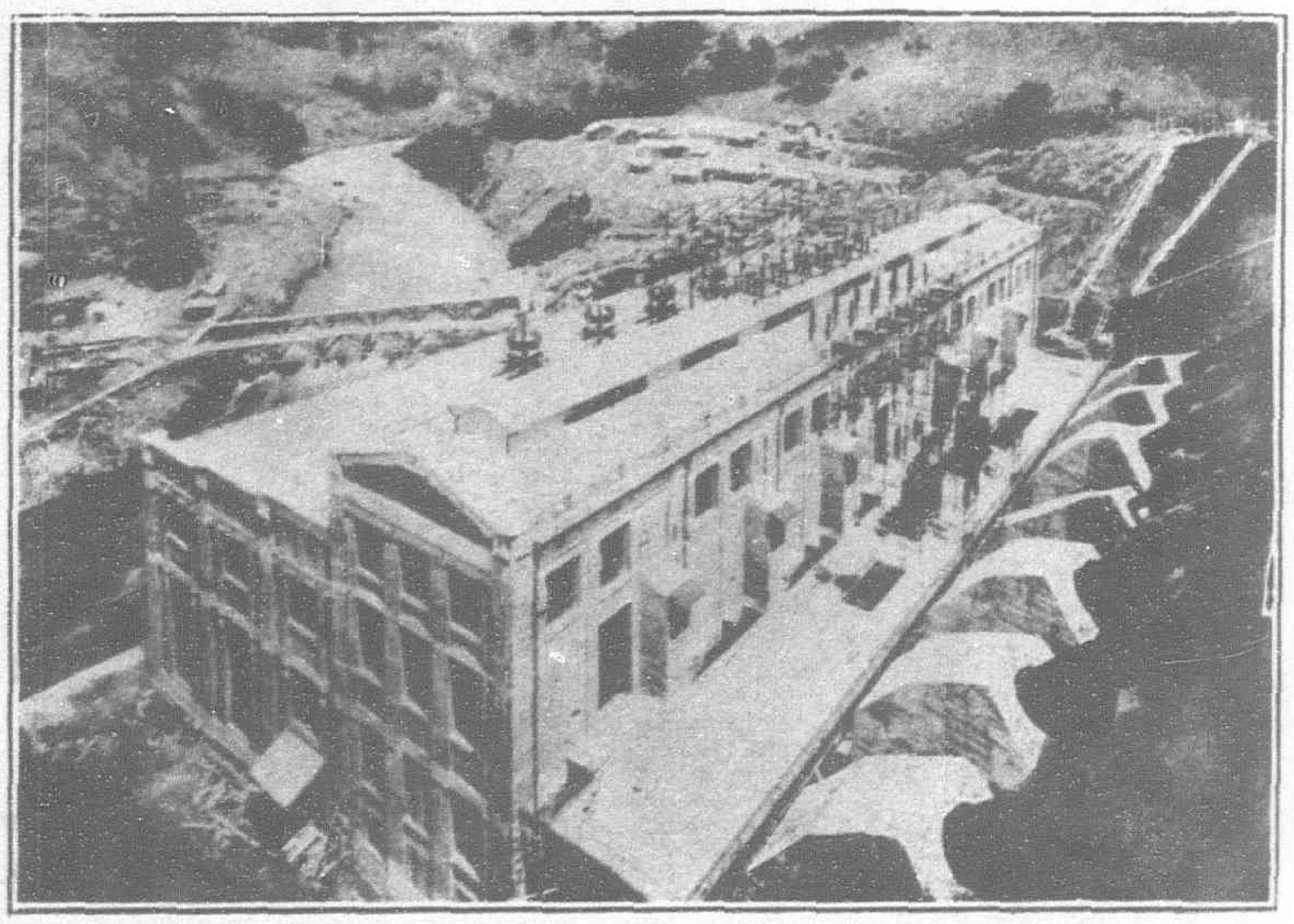
No. 1 Power House

| Power House | Mean Effective Head | Maximum Water Quantity | Theoretical H.P. |
|---|---|---|---|
| No. 1 .. | 352.4 ft. | 1,600 c.f.s. | 64,000 |
| No. 2 .. | 228.2 ,, | 1,600 ,, | 41,400 |
| No. 3 .. | 133 ,, | 1,478 ,, | 22,300 |
| No. 4 .. | 211 ,, | 1,450 ,, | 34,700 |
| Onogawa | 202 ,, | 485 ,, | 11,100 |
| Kawakami | 274 ,, | 897 ,, | 27,900 |
| Myoka .. | 288 ,, | 869 ,, | 28,400 |
| | | Total .. | 229,800 |

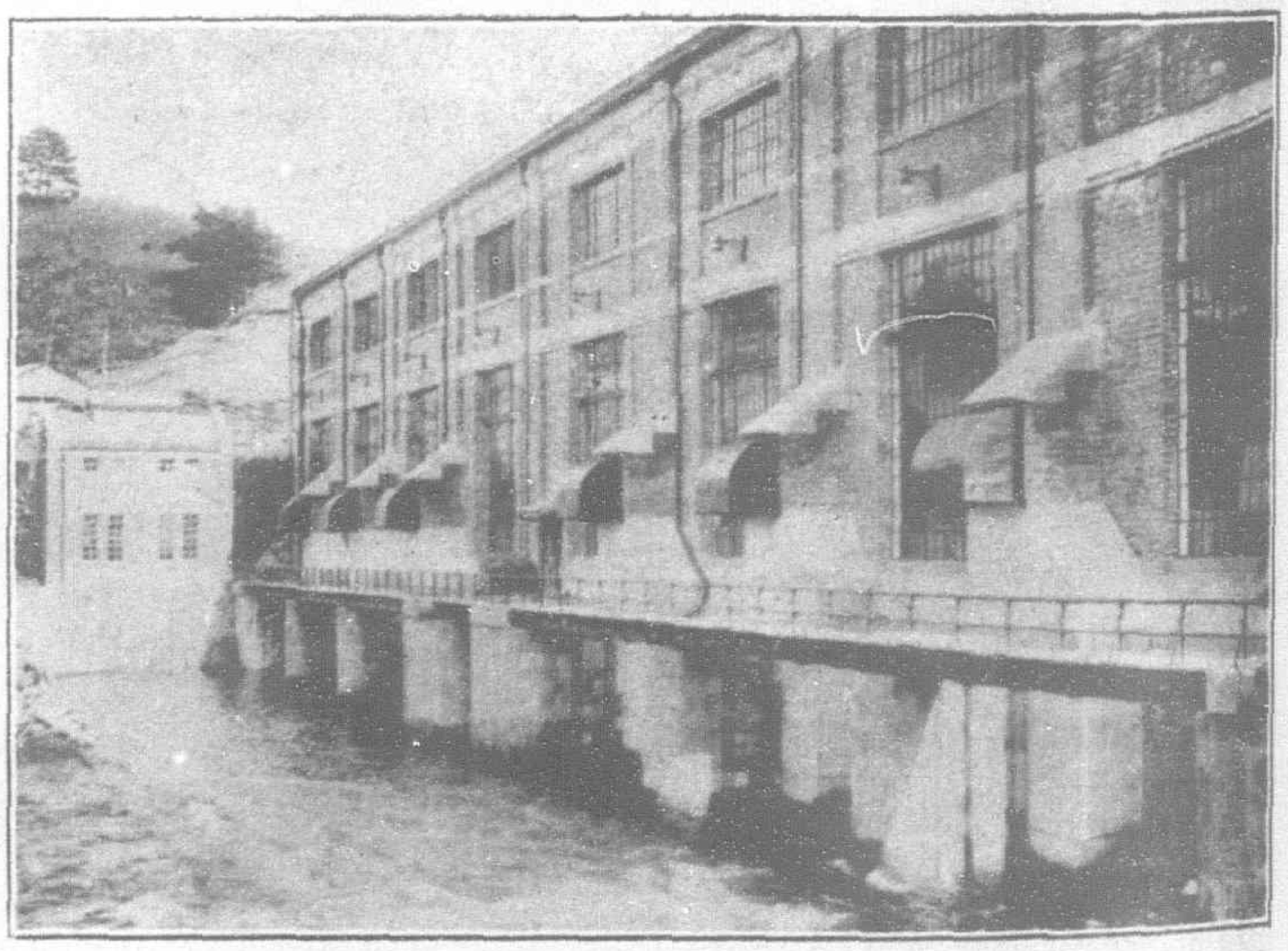
The output of the above seven power stations is to be centralized at No. 1 power house near Lake Inawashiro. The transmission lines run southward, passing through a mountainous region until they arrive at the town of Shirakawa. Thence they follow the government railway, traversing flat country, touching at the cities of Utsunomiya and Koga, and terminating at the Tabata receiving station near the city of Tokyo.

## Power Canals

Taking advantage of the topographical conditions of the district, the aggregate effective head of about 900-ft. along the Nippashi River is to be divided into four sections, with a power house for each section. Along the Nagase River, there will be installed three power houses and one canal without power house. The design of each canal will be found on next page.



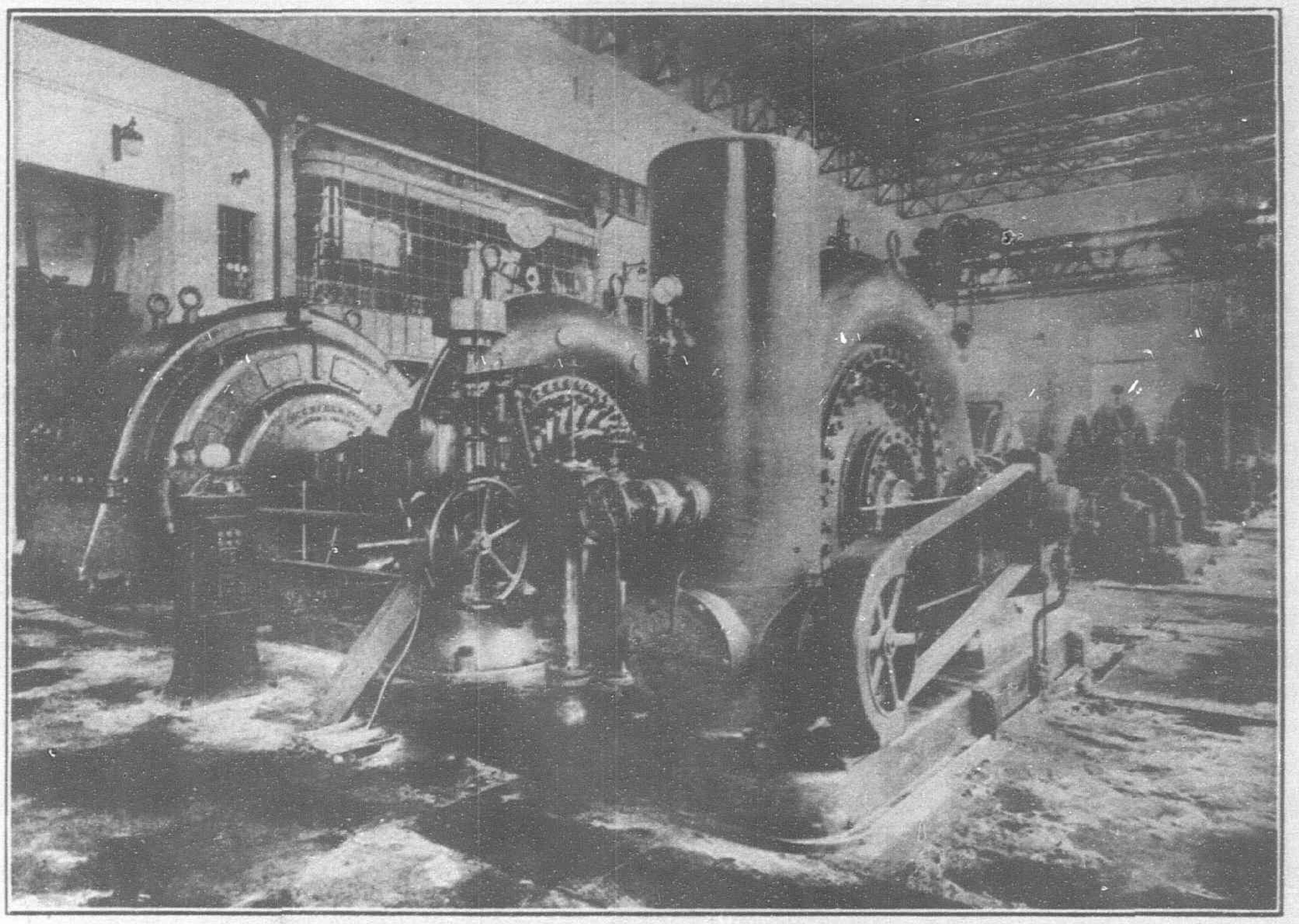
Roof Installation of No. 1 Power House



Tail Race of No. 1 Power House

No. 1 Power Canal.—The intake is placed at about 5,580-ft. down stream from "Juroku-kyo," which is located at the mouth of Lake Inawashiro. The length of the canal is about 7,920-ft., consisting of two tunnels, four open canals, five conduits, and two aqueducts. There are six (one spare) main pressure pipe lines, inner diameter being about 7-ft., and one exciter pipe line, under an effective head of 352.4-ft. The water from the tail-race of the power-house discharges directly into the Nippashi River. The grades of the canal varies from 1-ft. in 1,500 to 1-ft. in 2,000-ft.

No. 2 Power Canal.—The intake is placed near by the tail-race of No. 1 power house; total length, 3,990-ft., consisting of one tunnel and one open canal. There are five (one spare) main pipe lines, inner diameter about 7-ft., under an effective head of 228.2-ft. The water from the tail-race of the power house discharges directly into the Nippashi River. The grade of the canal is 1-ft. per 1,500-ft.



**Generator and Turbine (English Electric Co., Ltd), Dick, Kerr Alternators, and J. M. Voith Water Wheels**

No. 3 Power Canal.—The intake is placed near by the tail-race of No. 2 power house. The total length of the head canal is 5,670-ft., consisting of one tunnel, 2,450-ft., and one open canal, 3,220-ft. long. There are four (one for spare) main pipe lines, inner diameter about 7-ft. 6-in., under an effective head of 133-ft. The water from the turbine discharges directly into the common tail-race. The total length of the tail-race is 1,300-ft., consisting of one open canal. The grade of the head canal is similar to that of No. 1 Power Canal.

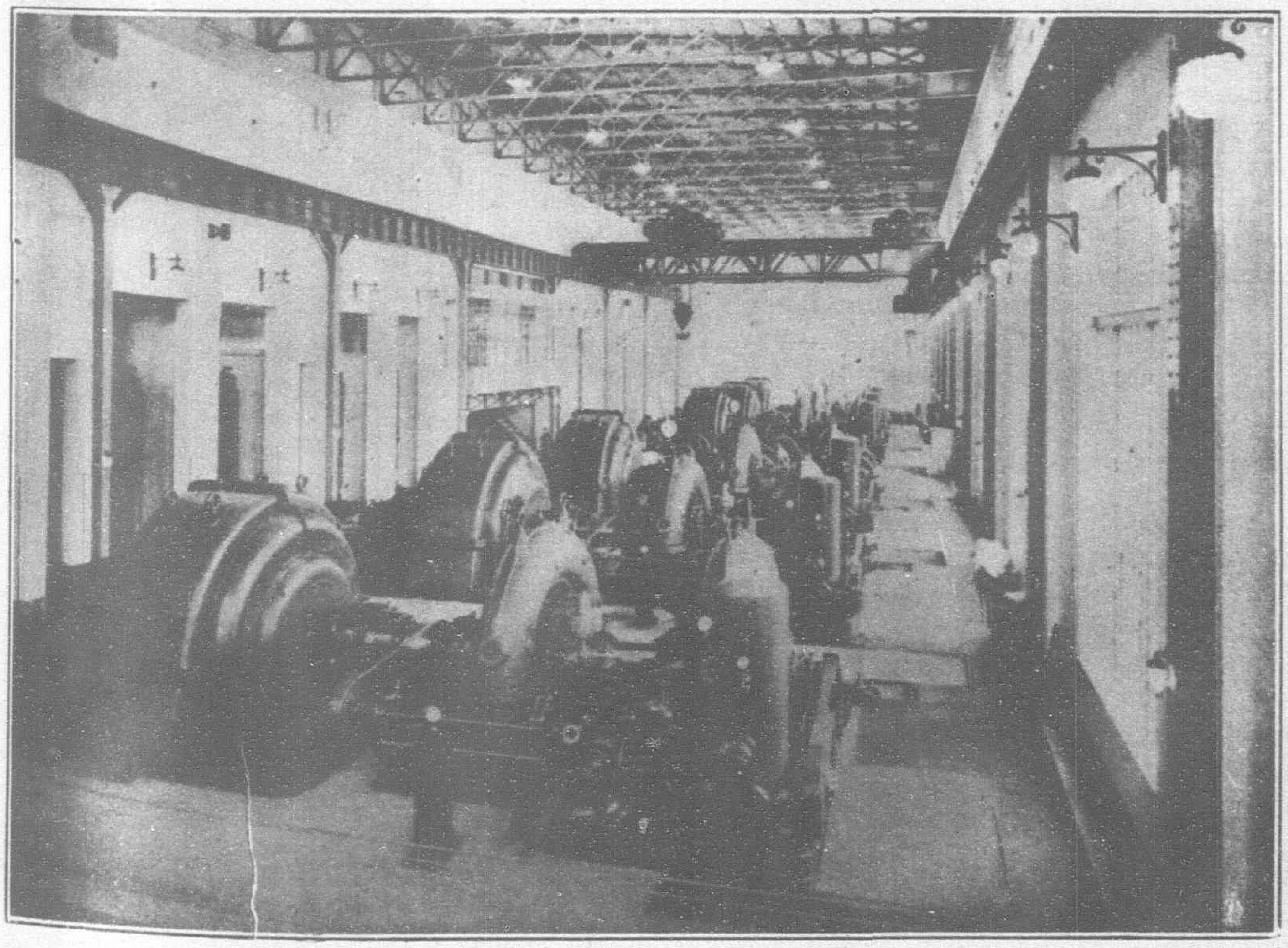
No. 4 Power Canal.—The intake is located at Uchigoe in Bandai village, about one mile and quarter down stream from No. 3 Power House. The total length of the canal is 11,160-ft., consisting of tunnels aggregating 1,590-ft. and open canals aggregating 9,570-ft. in length. There are four (one spare) main pipe lines, inner diameter about 7-ft. 6-in., under an effective head of 211-ft. The water from the tail-race of the power house discharges directly into the Nippashi River. The grade of the canal is similar to that of No. 1 Power Canal.

Onogawa Power Canal.—The intake is located on the south-eastern shore of Lake Onogawa. Total length is 6,550-ft. consisting of one tunnel and one open canal. There are two main pipe lines, inner diameter about 6-ft., under an effective head of 202-ft. The water from the tail-race of the power house discharges directly into Lake Akimoto. The grade of the canal varies from 1-ft. per 1,200-ft. to 1-ft. per 1,500-ft.

Kawakami Power Canal.—The intake is located on the south-western shore of Lake Akimoto. Total length, 11,430-ft., consisting of one tunnel and one open canal. There are four (one spare) main pipe lines, inner diameter about 6-ft. 6-in., under an effective head of 274-ft. The water from the tail-race of the power house discharges into the Nagase River. The grade is similar to that of the Onogawa power canal.

Myoka Power Canal.—The intake is placed near by the tail-race of Kawakami power house. The head canal consists of one tunnel of 7,580-ft. long. There are four (one spare) main pipe lines, inner diameter about 6-ft. 6-in., under an effective head of 288-ft. The water from the turbine discharges into the Nagase River through a tunnel and an open canal. The grade is similar to that of Onogawa power canal.

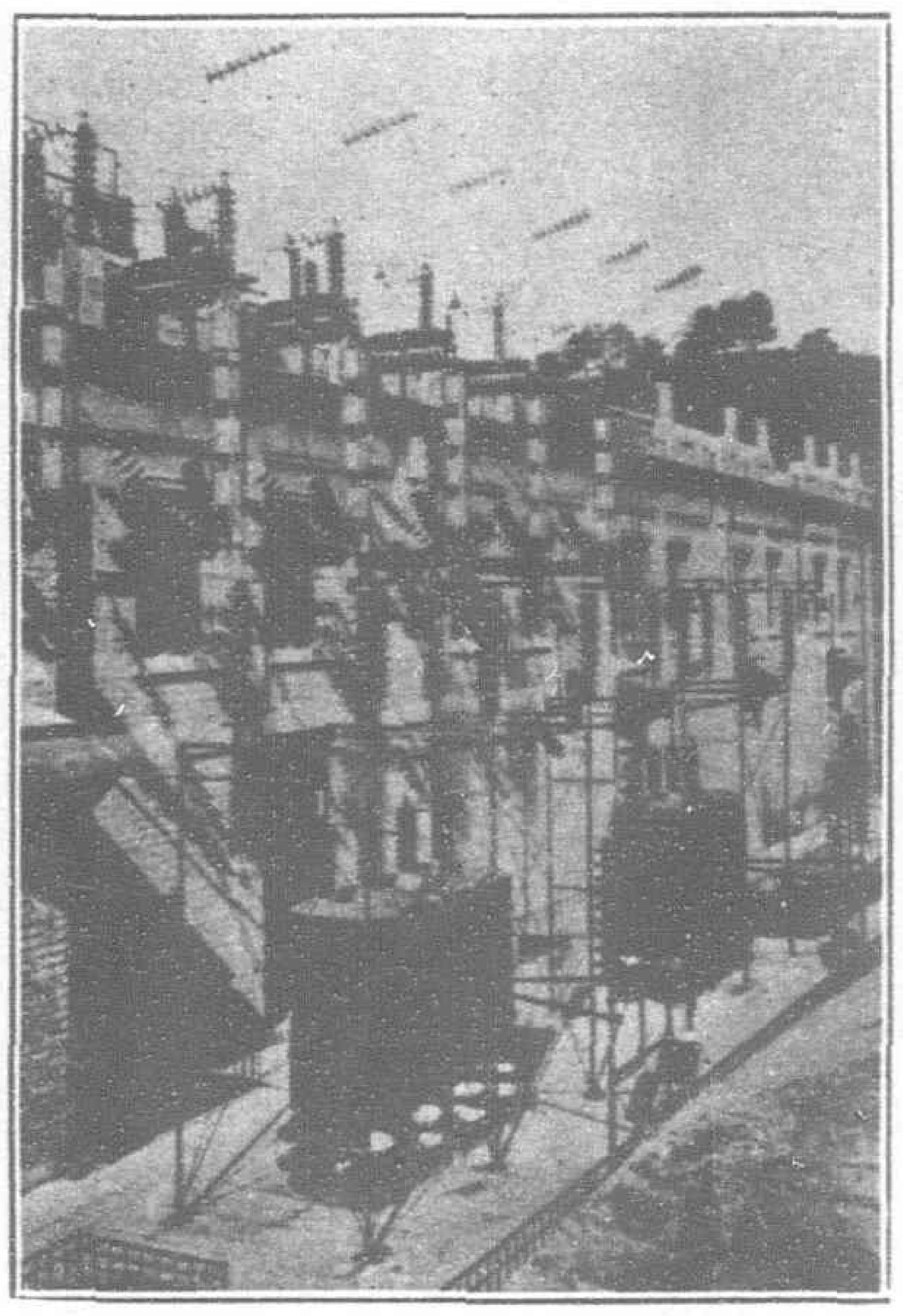
Nagamine Canal.—The intake is located on the south-eastern shore of Lake Hibara and the discharge end at the south-western shore of the Lake Onogawa. Total length of the canal is 5,070-ft. consisting of one tunnel and two open canals. This canal is to be used to discharge the reserve water in Lake Hibara.

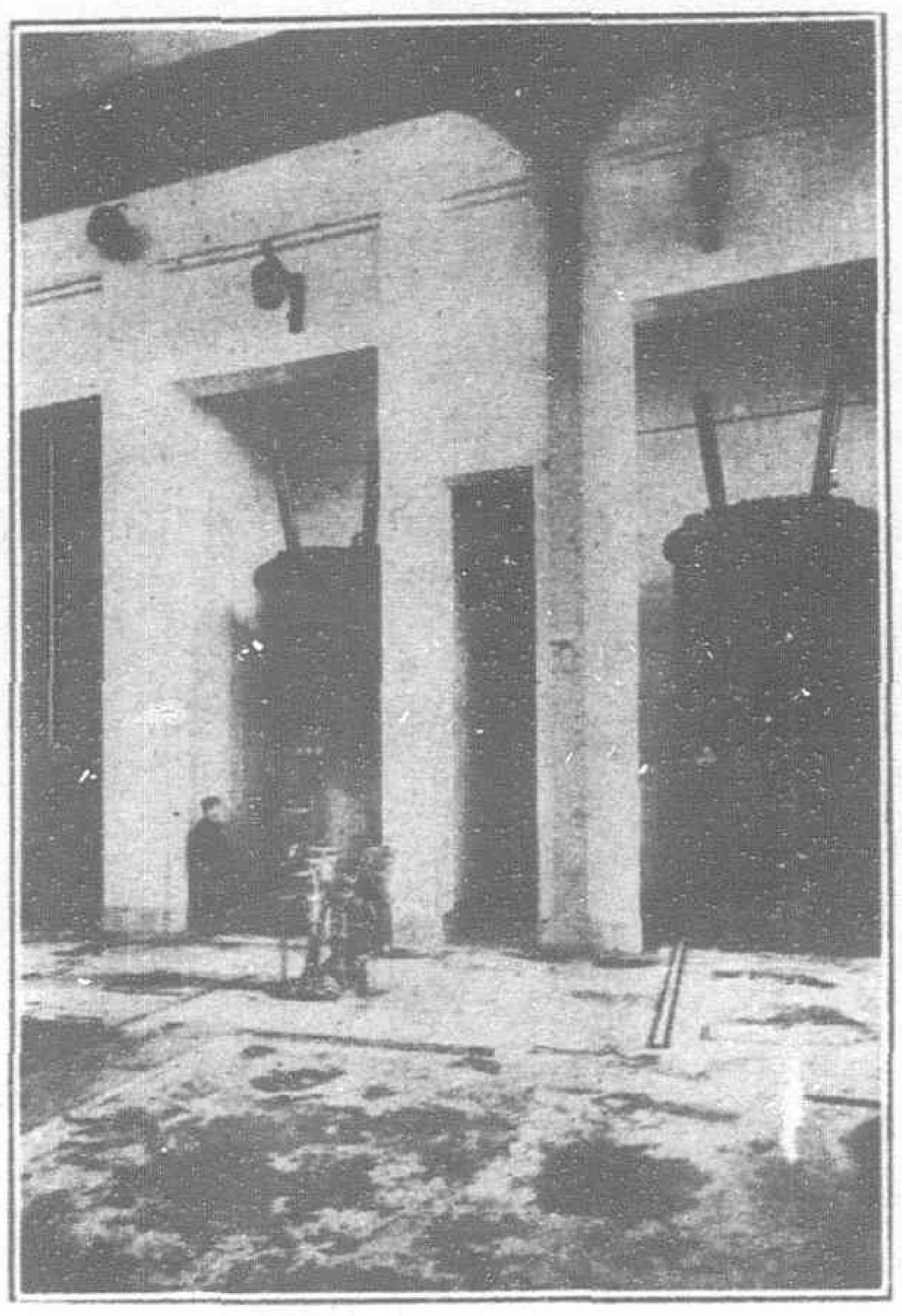


**General View of Generating Room, Power House No. 1**

## Power Houses

Power is generated by alternating current generators, direct coupled to water turbines, in three-phase, 6,600-volt, three-wire system. It is stepped up by transformers to 115,000 volts, and transmitted to the city of Tokyo. The line voltage at Tokyo, the receiving end of the line, is calculated to be 100,000 volts, which is stepped down by transformers to 11,000 volts and then distributed by underground cables to consumers in Tokyo and its suburbs. Power for small consumers in the neighborhood of the receiving station is supplied directly from the station by 3,300 volt transformers connected to the 11,000-volt-bus bar of the station. Power consumed in the neighborhood of the generating station is supplied at 6,600 volts.


High Tension Lightning Arresters


Main Transformers

The generating units in the seven stations will be as follows:

No. 1 **Power House.**—Six sets (including one spare set) of 11,250 h.p. turbines and 7,777 k.v.a. generators.

No. 2. **Power House.**—Five sets (including one spare set) of 10,250 h.p. turbines and 6,666 k.v.a. generators.

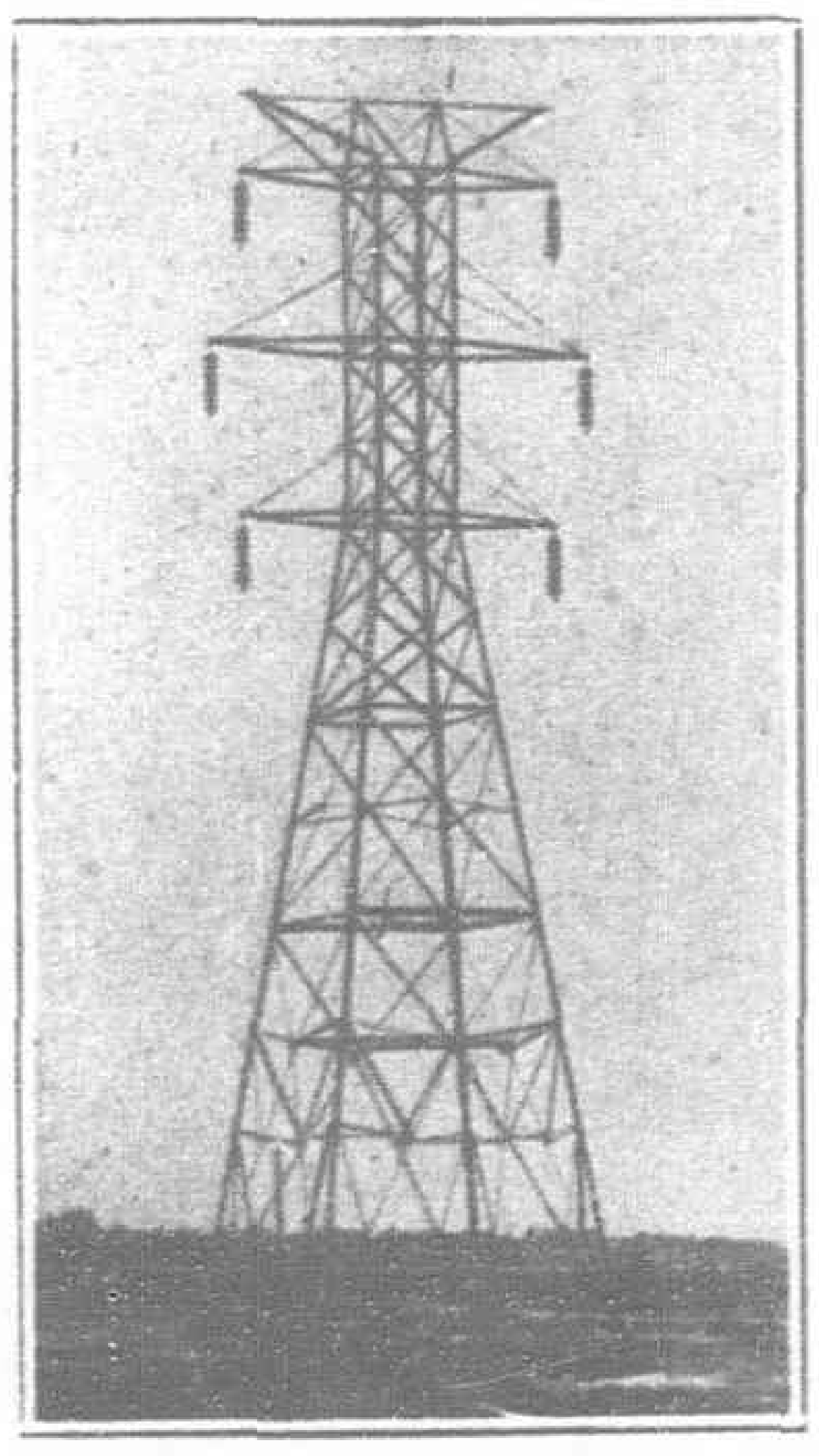
No. 3. **Power House.**—Four sets (including one spare set) of 7,500 h.p. turbines and 4,800 k.v.a. generators.

No. 4. **Power House.**—Four sets (including one spare set) of 11,500 h.p. turbines and 7,500 k.v.a. generators.

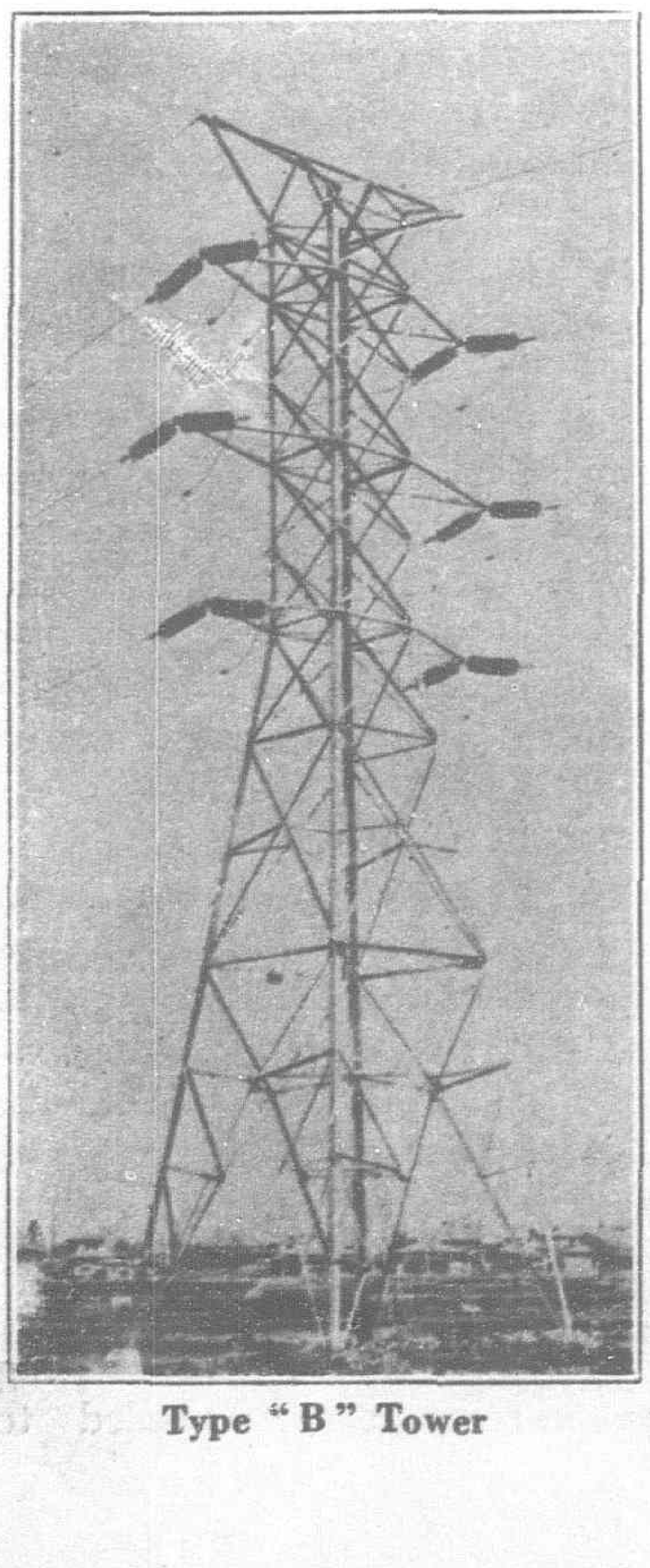
**Onogawa Power House.**—Two sets of 7,200 h.p. turbines and 4,600 k.v.a. generators.

**Kawakami Power House.**—Four sets (including one spare set) of 9,400 h.p. turbines and 6,000 k.v.a. generators.

**Myoka Power House.**—Four sets (including one spare set) of 9,400 h.p. turbine and 6,000 k.v.a. generators.


Type "A" Tower

The main transmission line of bare copper cables suspended on steel towers, as well as tie lines between adjacent generating stations, will carry 115,000 volts. The main transmission line consists of two tower lines, each carrying two circuits thereon, while the tie line has only one tower line, carrying also two circuits.


Type "B" Tower

## Reliable Water Supply

As far back as 1878, Mr. Van Dorn, a Dutch engineer, investigated and reported upon a plan for a vast tract of rice lands belonging to Asaka county. This plan provided for a maximum water supply of 200 cubic feet per second, drawn from Lake Inawashiro at Yamagata, a small village on its eastern bank. The Asaka Irrigating Association was then organized and with official approval erected the reglating gates called "Juroku-kyo," at Tonokuchi, at the mouth of the Nippashi River, the one outlet of Lake Inawashiro. From that date a watchman has been stationed to regulate the gates so as to maintain the lake at a constant level (within a certain margin) and keep a record of the water levels both inside and outside of the gates. These records show that the volume of water in the Nippashi River is amply sufficient to provide for the plans of the new enterprise.

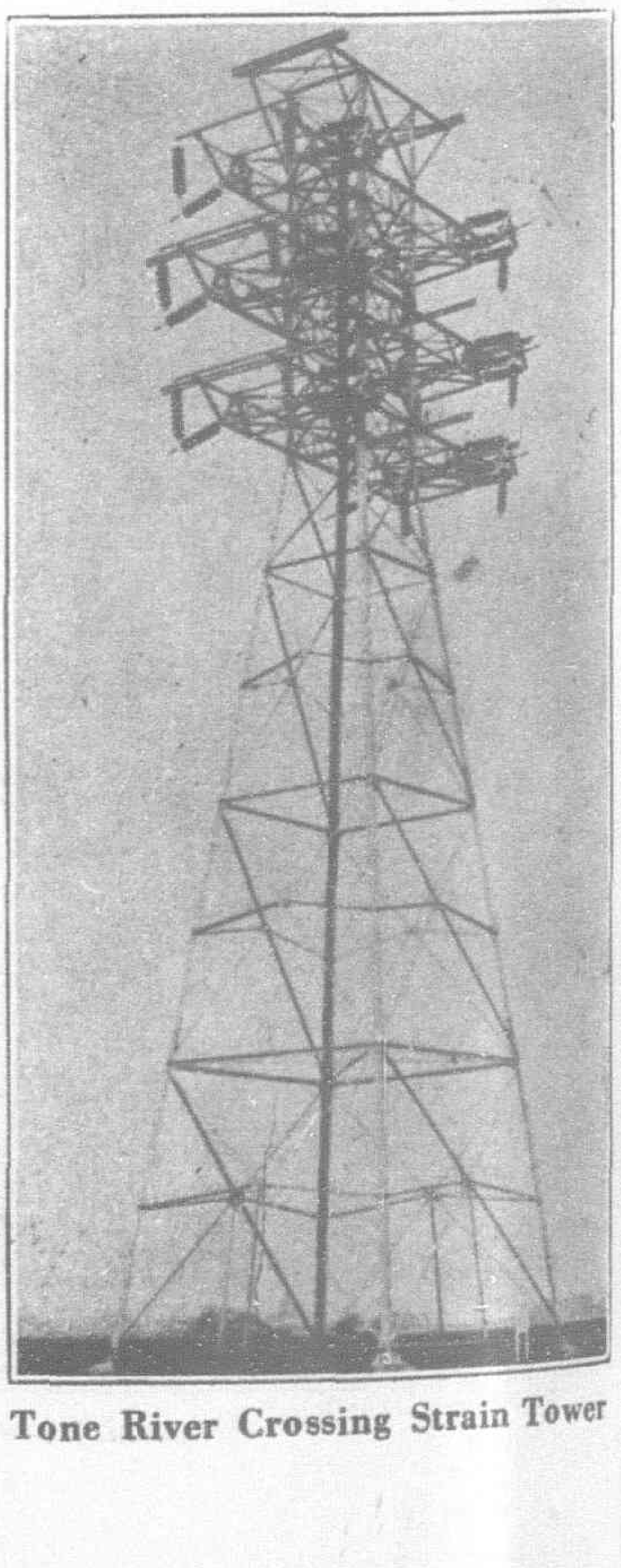
## Flexibility of Supply

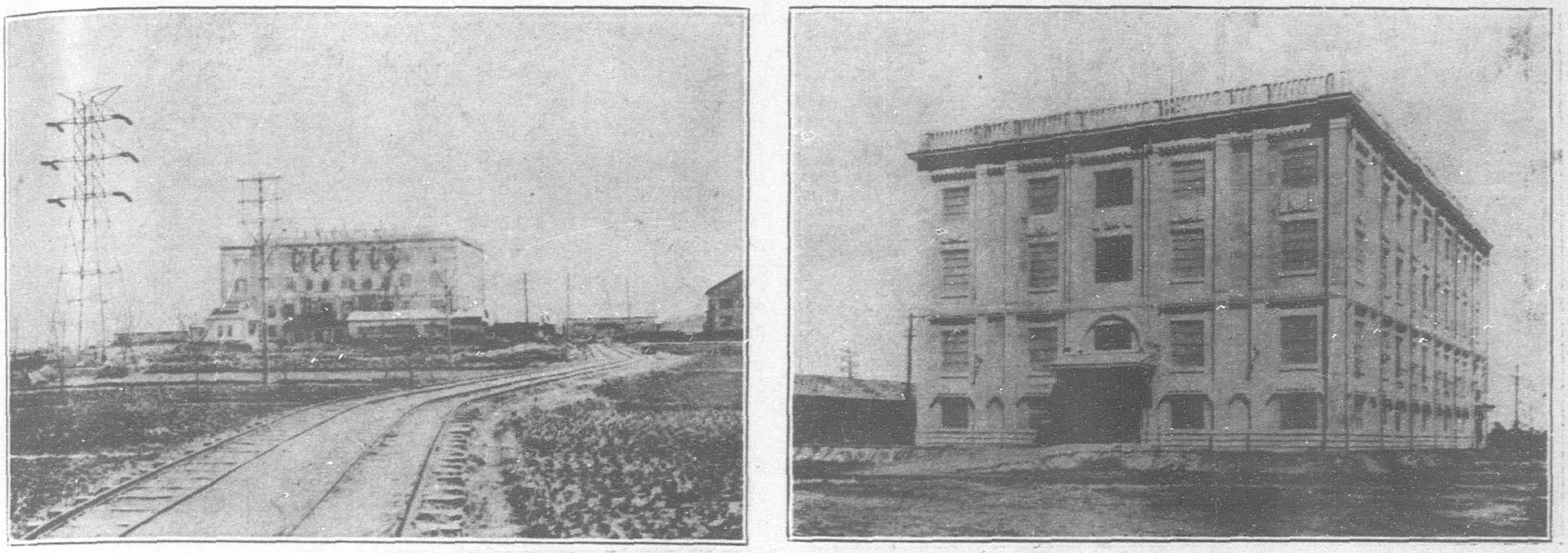
In regard to the regulation of the "Jurcku-kyo" gates, the Association fixed the limits of high and low-water levels of Lake Inawashiro, so as to prevent the overflowing of the lake or a scarcity of water in the irrigation canal. The quantity of water in the lake included within these two extreme levels, can be utilized as storage for the hydro-electric power plant.

As Lake Inawashiro covers about 42 square miles, and the difference of the two extreme levels is 3.2 feet, there is storage capacity of about 3,500 million cubic feet. The rights to use this volume of storage water were acquired by the Inawashiro Hydro-Electric Power Co. Moreover, the company also secured the right to use Lakes Hibara, Onogawa and Akimoto as storage reservoirs, and a dam was built at the outlet of each. The storage capacity of these three lakes is 4,200, 330 and 1,100 million cubic feet, respectively. The total storage capacity in the four lakes is figured to be not less than 9,100 million cubic feet. With such a large reservoir close to power houses, the Inawashiro enterprise can always rely on an ample water supply, with no danger of floods in the river. These resources enable the company to construct and manage its power houses under most safe and economical conditions.

## Construction Work

Although Lake Inawashiro is encircled by a range of high mountains and the fall of the Nippashi River bed is so steep that the rapids are about ten miles long, the general character of both banks of the river is very flat. Therefore, the aggregate length of the power canals along the Nippashi River, consisting mostly of open canals cut in flat country, is not more than about 30,000 feet for the total effective head of 924.6 feet. Moreover, there are a number of railway stations around Lake Inawashiro and the Nippashi River, within easy access to the power canals and power houses, which help to facilitate and cheapen the cost of construction.


Tone River Crossing Strain Tower



Tabata Receiving Station, Tokyo, Front and Rear Views

## First and Second Installations

Renewal of "Juroku-kyo," construction of generating station No. 1, transmission line, A (two circuits), telephone line and Tabata receiving station, were included in the the first installation. This was completed and passed by the government on March 15th 1915, since when it has been in actual service.

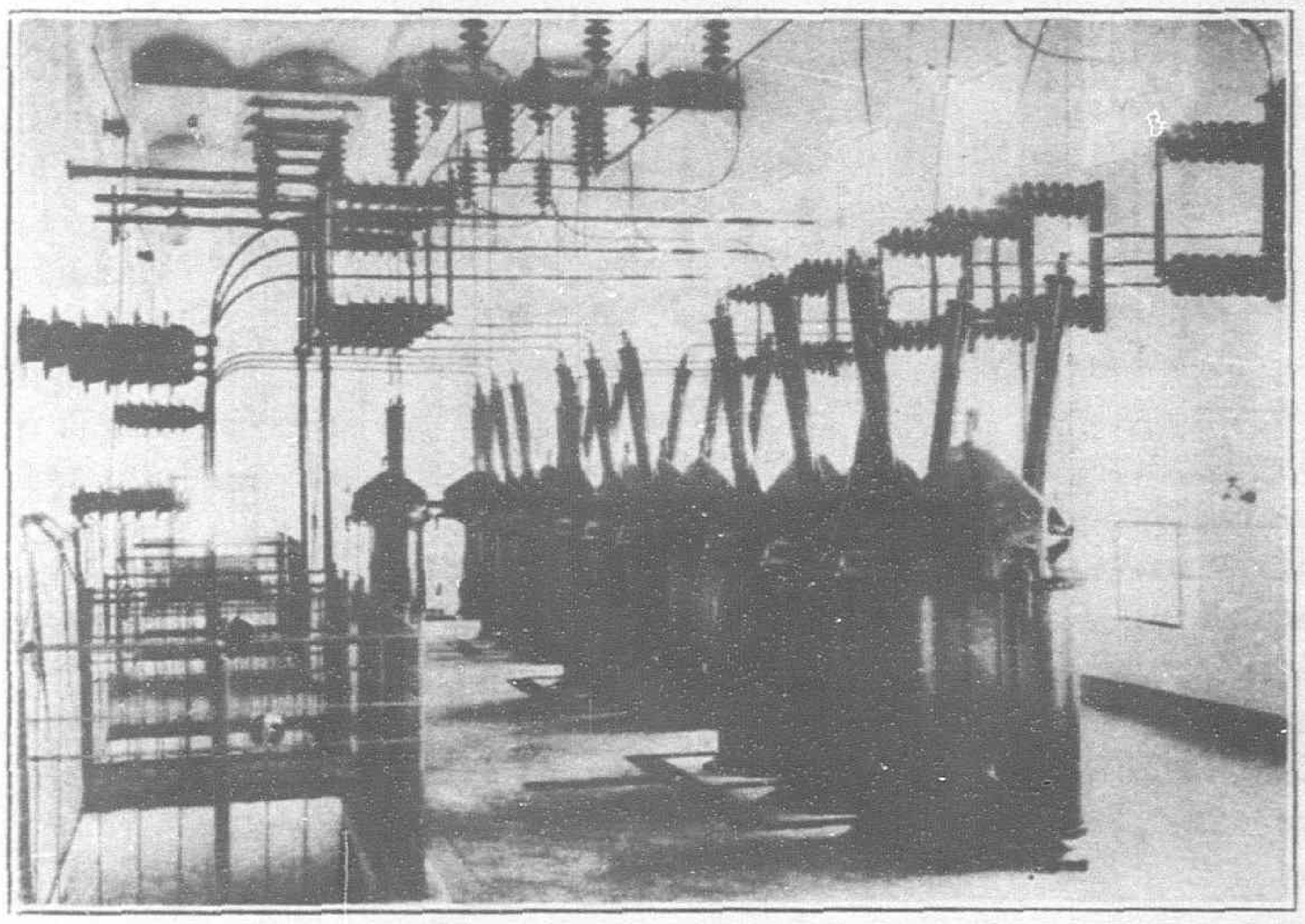
Construction of dams at the outlets of Lakes Hibara, Onogawa and Akimoto, construction of No. 2 generating station, transmission line between No. 1 and No. 2 generating stations, and synchronous condenser equipments in Tabata receiving station were the features of the second installation. This was completed and passed by the government on August 1st, 1919, since when it has been in active operation.

## "Juroku-Kyo"

"Juroku-kyo" erected by the Asaka Irrigating Association, is a stone masonry bridge across the Nippashi River at the outlet of the lake with fifteen piers, each pier serving as a support for sluice gate which regulates the level of Lake Inawashiro. It is to be now reconstructed, for the exclusive use of traffic, while new gates for regulating the water level are to be constructed at a point 60-ft. down-stream. These new gates will regulate the flow of water in the Nippashi River within the restrictions imposed by the government for maintaining a certain level in Lake Inawashiro.

The general features of these regulating gates are as follows :

Total Length of Regulating Gates : 250-ft.



High Tension Switch Room

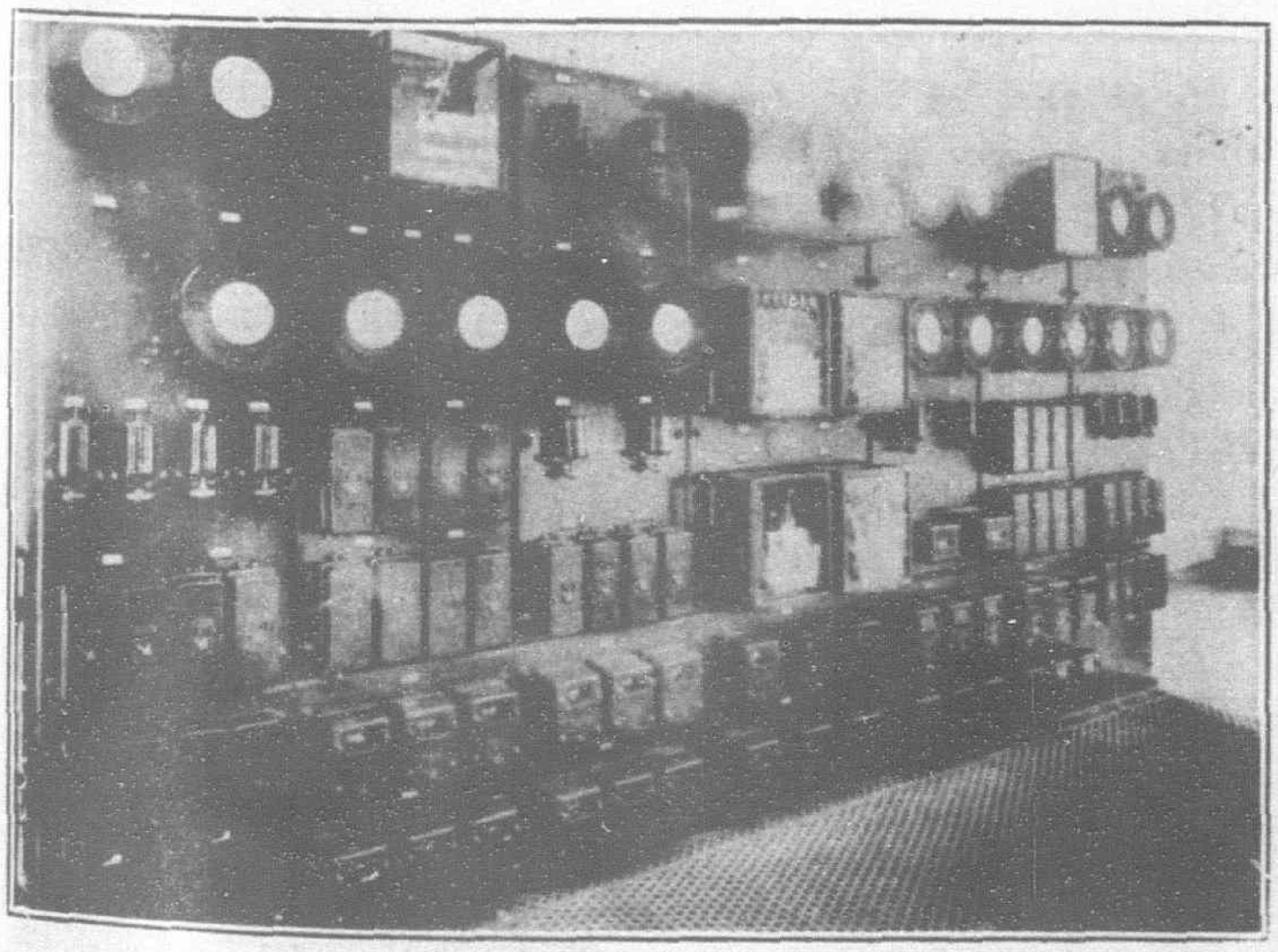
Number of Gates.—Sixteen in all. Thirteen are to let the water flow into the Nippashi River for the company's use; the remaining three are for other water users.

Piers.—Fifteen in all; thirteen are four feet thick, and two six feet thick.

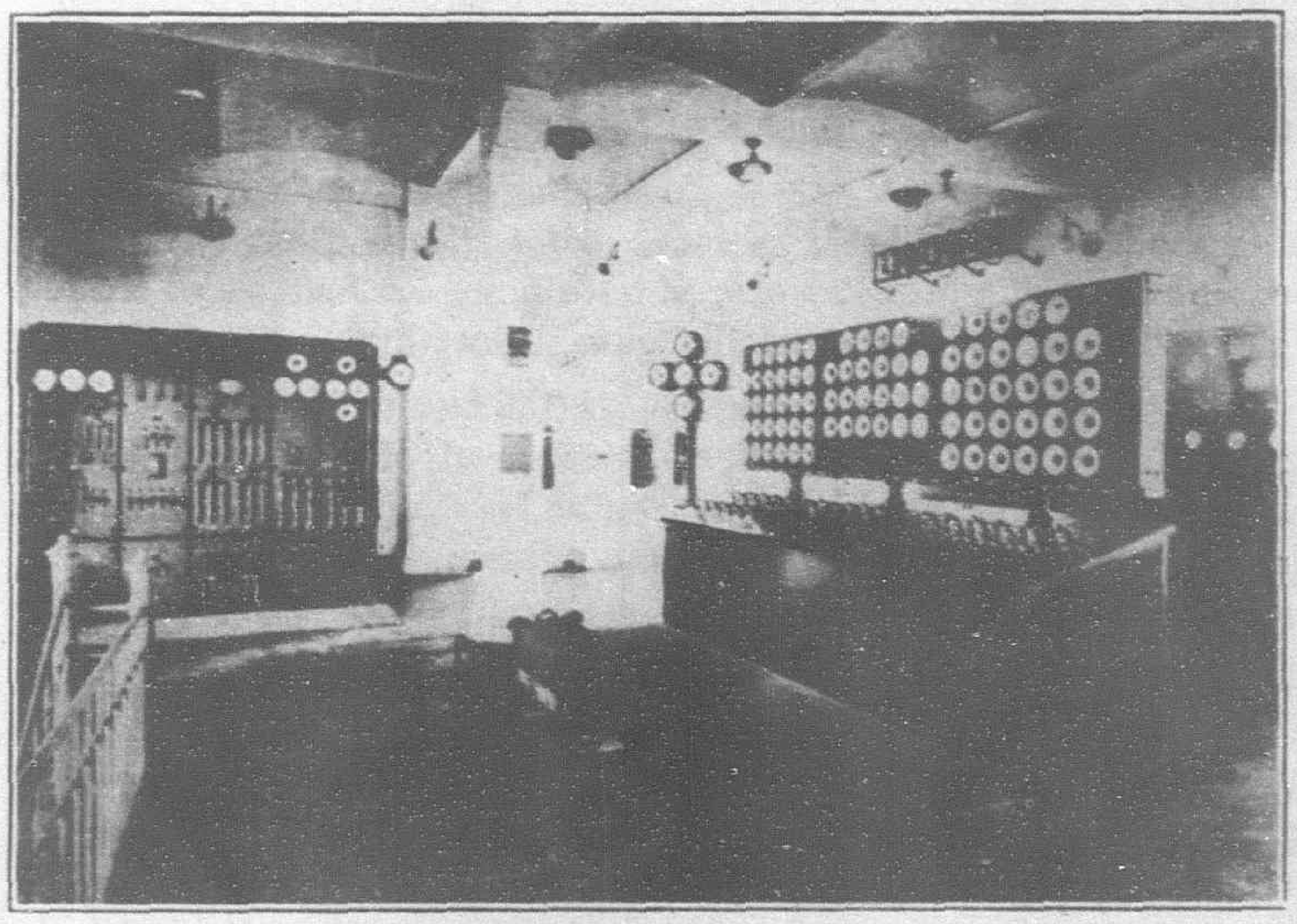
Gates.—All gates are made of steel, operated by either by hand or electric motor. They are nine feet high, with twelve feet span for thirteen gates and ten feet for the remaining three.

## Lake Hibara

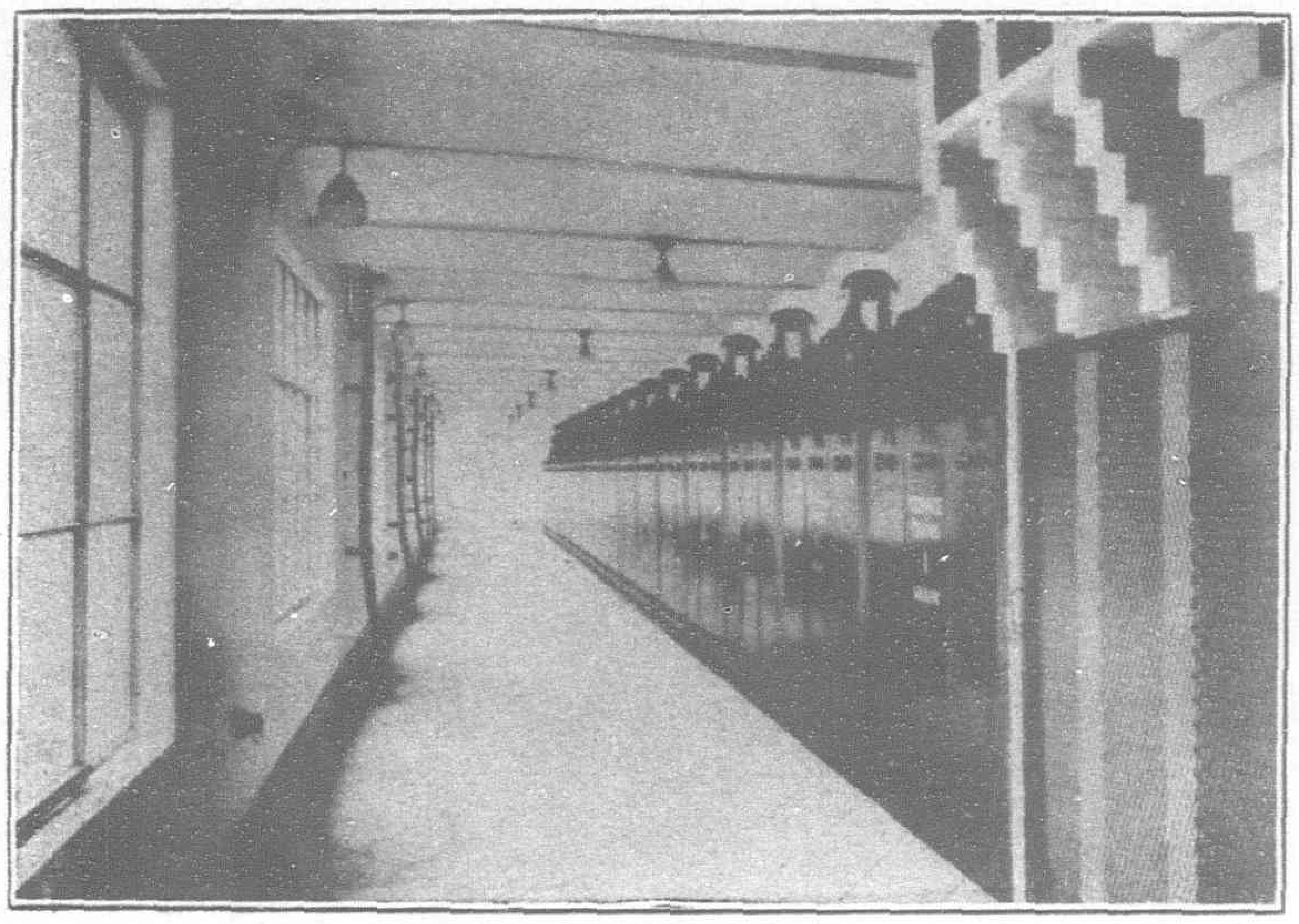
A dam and regulating gates were constructed at the natural outlet of Hake Hibara in order to convert the lake into the company,s reservoir. The general features of the dam and regulating gates follows.



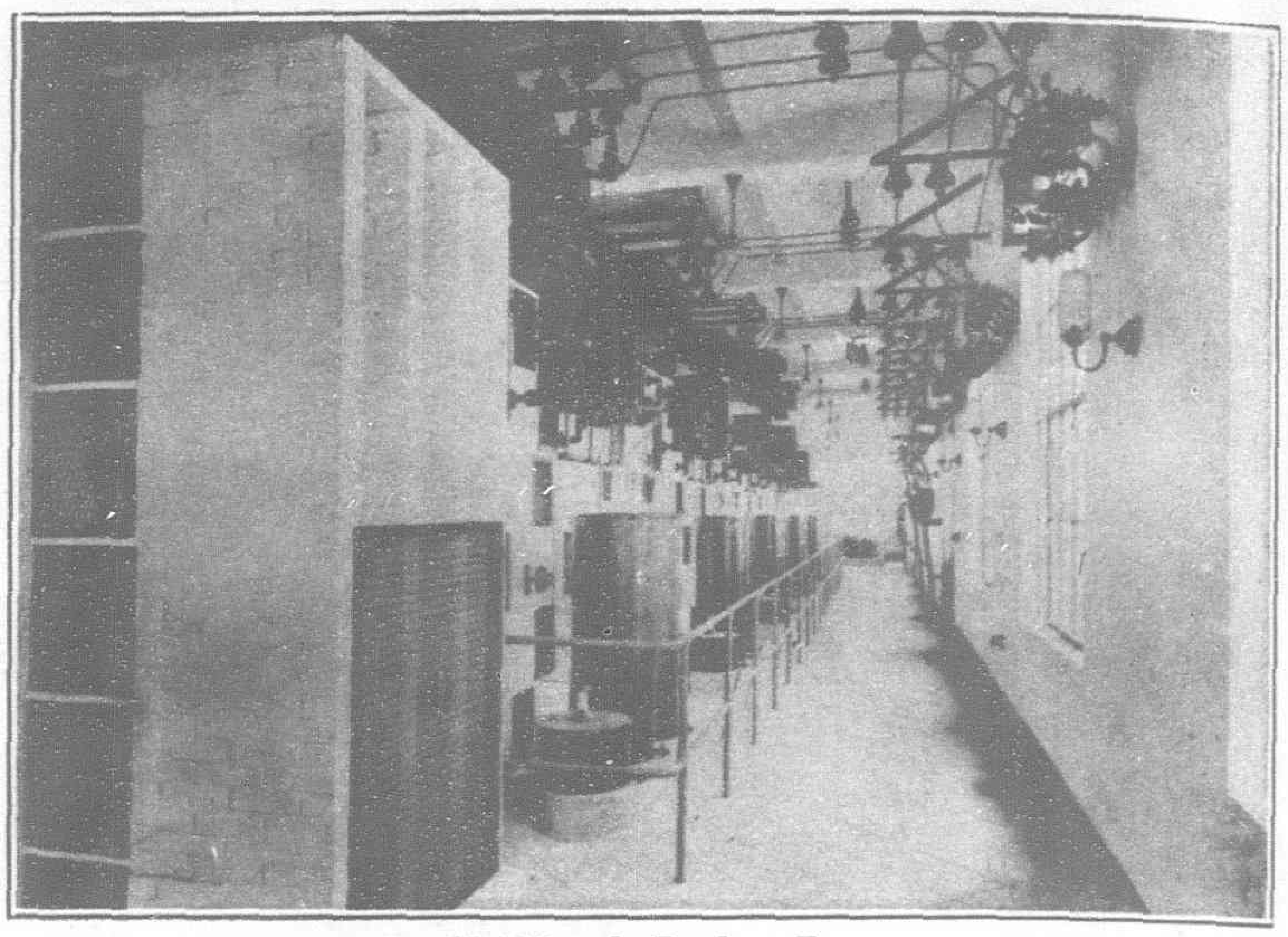
Relay Board



Main Control and Service Board



11,000 volt Oil Switch Room



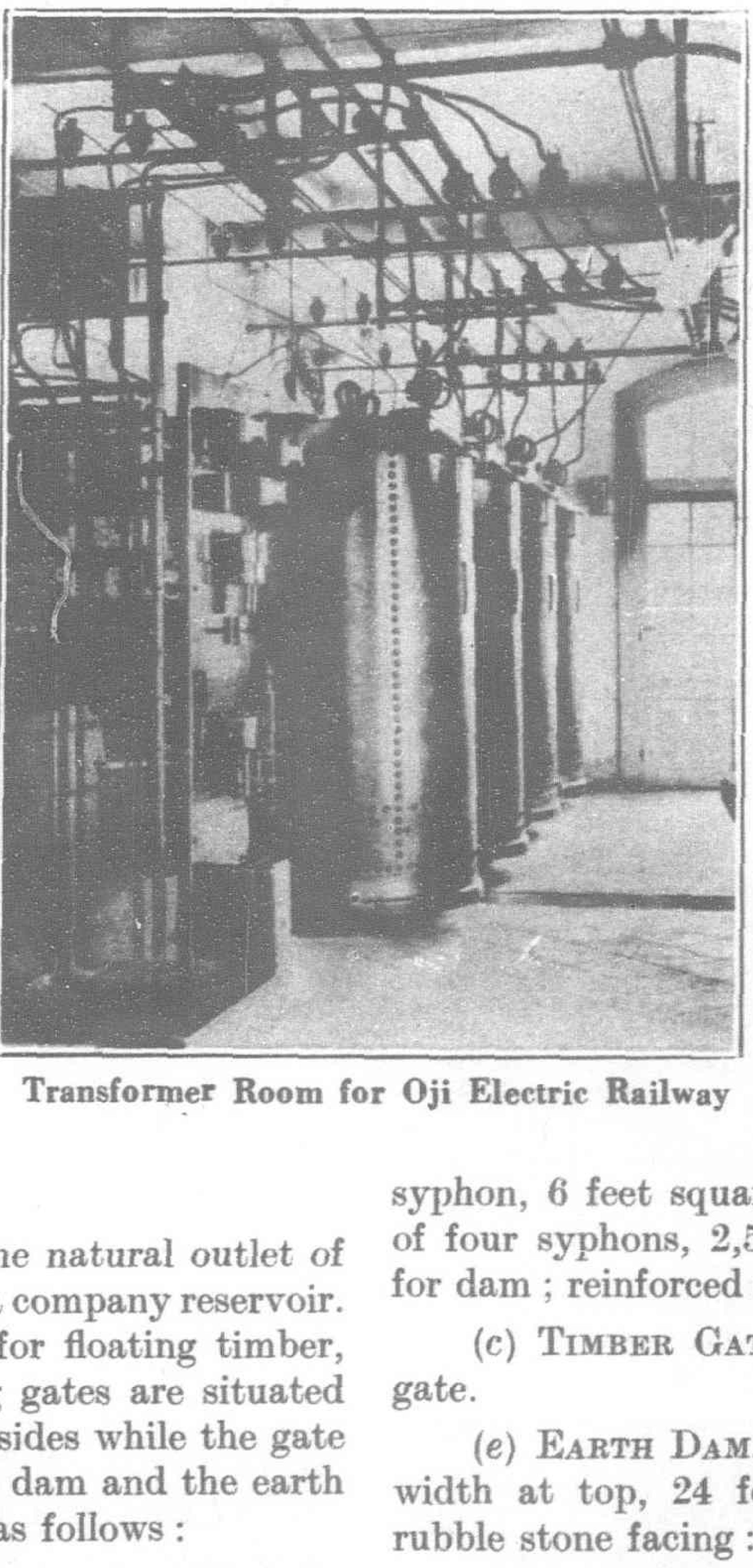
11,000 volt Busbar Room

(*a*) Dam.—Type, overflow type with parabollic down stream surface, with flash-boards for one section: length, total, 783 feet; length of dam with flash-boards, 624 feet, without flash-boards, 159 feet: height, 27.5 feet at highest part: height of flash-boards, 2 feet: structure, concrete with rubble stone facing.

(*b*) Gate.—Total length of structure, 35-ft.: height, 27.5 feet: width, 24 feet: number of gates, 2: size of gate hole, 6 feet wide, 6 feet high: gate, hand operated wooden gate, 7 feet high: piers, concrete without stone facing.

(*c*) Reservoir Capacity.—Useful depth of water, 18 feet: quantity of water reserved, 2,100 million cubic feet.

In order to increase the storage capacity of the lake, a canal from the south-eastern shore of this lake to the south-western shore of Lake Onogawa is now being constructed. After its completion, the useful depth and quantity of water stored in the lake will be 43 feet and 4,200 million cubic feet, respectively.



Transformer Room for Oji Electric Railway

## Lake Onogawa

Gates and dam have been constructed at the natural outlet of Lake Onogawa in order to convert the lake into a company reservoir. These consist of regulating gates and a gate for floating timber, with earth and syphon dams. The regulating gates are situated at the centre, with the syphon dams on booth sides while the gate for floating timber is at one side of the syphon dam and the earth dams at both ends. The general features are as follows:

(*a*) Regulating Gates.—Total length of structure, 33 feet: total height, of structure, 29 feet: total width, of structure, 23.2 feet: number of gates, 2: size of gate hole, 5.6 feet wide, 5.6 feet high: gate, hand operated wooden gate, 7 feet high: pier, concrete.

(*b*) Syphon Dams.—Total length, 120 feet: number of syphon, 6: section of syphon, 6 feet square: head of syphon, 11.9 feet: total capacity of six syphons, 3,500 cubic feet per second: structure, concrete dam. Reinforced concrete syphon.

(*c*) Gate for Floating Wood.—Height of gate, 6.5 feet: width, 5 feet: type, log gate.

(*e*) Earth Dam.—Length, 102 feet: width at top, 15 feet: slope, 1 foot in 2.5 feet: front surface, rubble stone facing; back surface, lawn facing.

(*f*) Reservoir Capacity.—Useful depth of water, 105 feet: quantity of water stored, 220 million cubic feet.

After the completion of the Onogawa generating station, the useful depth and quantity of water stored in the lake will be 29 feet and 330 million cubic feet, respectively.

## Lake Akimoto

Gates and dams have been constructed at the natural outlet of Lake Akimoto. In addition to the regulating gates, there is one for floating timber with syphon dams, masonry and earth dam. The regulating gates are situated at the centre, with syphon dams at both sides of the regulating gates; the gate for floating timber at one side of the syphon dam and the earth and masonry dams at both ends. The general features are as follows:

(*a*) Regulating Gates.—Total length of structure, 39 feet: height, 37 feet: width, 22 feet; number of gates, 2: size of gate holes, 5 feet high, 5 feet wide: gate, hand operated wooden gate, 6 feet high: pier, concrete.

(*b*) Syphon Dams.—Total length, 86 feet: number of syphons, 4: section of syphon, 6 feet square: head of syphon, 19.5 feet: total capacity of four syphons, 2,550 cubic feet per second: structure, concrete for dam; reinforced concrete for syphon.

(*c*) Timber Gate.—Height, 6 feet: width, 5 feet: type, log gate.

(*e*) Earth Dam.—Length, 1,290 feet: mean height, 33 feet: width at top, 24 feet: slope, 1 foot in 2.5 feet: front surface, rubble stone facing: back surface, lawn facing.

(*f*) Masonry Dam.—Type, overflow with parabolic down stream surface: length, 582 feet: mean height, 19 feet: width at top, 3 feet: structure, concrete with rubble stone facing.

(*g*) Reservoir Capacity.—Useful depth of water, 20 feet: quantity of water stored, 750 million cubic feet.

After the completion of the Kawakami generating station, the useful depth and quantity of water stored in the lake will be 39 feet and 1,100 million cubic feet, respectively.

## Power Canal for No. 1 Generating Station

The total length, covering several sections of open canals, conduits, tunnels and aqueducts, is nearly 7,920 feet. The grade is one to two thousand for the upper section of 5,760 feet and one to fifteen hundred for the remaining section. The cross section of the canal is adequate for a flow of 1,600 cubic feet of water per second. A brief description of the work, follows :

(*a*) HEADWORKS.—This consists of an overflow dam across the river, with an intake for the power canal adjacent to the dam. The dam is designed to pass a maximum of 6,000 cubic feet of water per second over its spillway and 4,000 cubic feet per second through the sluice gates, a total of 10,000 cubic feet per second.

(1) DAM.—Type, overflow type with parabolic down stream surface: length, total, 389 feet; length of overflow proper, 238 feet, the remainder is taken up by the sluice gates: width at top, 5 feet: height, 18 feet from river bed: width at base, 40.5 feet: structure, concrete with rubble stone facing: sluice gates, there are two stoney type hand operated sluice gates, each 8 feet wide, 10 feet high.

(2) INTAKE.—Situation, about 5,580 feet down-stream from "Juroku-kyo" and on the up-stream side of the dam: intake gate, there are four stoney type hand or motor operated sluice gates, each 8 feet wide and 10 feet high: piers, concrete with brick and cut stone facing.

(*b*) OPEN CANAL.—Length, 5,410 feet, covering four separate sections from No. 1 to No. 4: structure, the canal is of concrete lined with cement mortar. There are four different standard sectional forms corresponding to the nature of soil and grade of canal. Thickness of concrete varies from 1 foot to 3 feet for the side walls and 1 foot throughout for the bottom. At the part where earth cutting was made, a bench of six feet wide is installed.

(*c*) CONDUIT.—Length, there are five sections, with an aggregate length of 704 feet: structure, cross section of the conduit is horse-shoe shape. The arch is constructed of reinforced concrete, while the side wall and invert of plain concrete. All the surface is lined with cement mortar. The earth cover on arch is 4 feet thick.

(*d*) TUNNEL.—Length, there are two sections, the first, 1,200 feet long, and the second, 275 feet long: structure, cross section of the tunnel is horse-shoe shape, 17 feet in height and radius. The side wall and invert are made of concrete, while the arch is brick work backed with rubble. All the surface is lined with cement mortar.

(*e*) AQUEDUCT.—Length, there are two aqueducts in the canal, the first 218 feet long and the other 268 feet long: structure, flume and supporting piers are made of reinforced concrete. Cross section of the flume is supported by a row of three columns, each 18 inch square, at intervals of 16 feet. The thickness of the flume is 17 inches at the side walls and 24 inches at the bottom.

(*f*) FOREBAY.—Size, 88 feet long by 122.5 feet wide: area, 10.780 square feet: depth, from 18 feet 10 inches to 21 feet 10 inches: sluice gate, there are eight stoney type hand or motor operated sluice gates, of which, six are for the main penstocks, one for exciter penstock, and one for the spillway. The size of each of the first ix sis 11 feet wide and 14 feet high, of the next, 4 feet wide and 11 feet high; and the last, 11 feet wide and 10 feet high: structure, side walls and bottom are of concrete work lined with cement mortar. Some parts are lined with brick and cut stone.

(*g*) SPILLWAY.—The water spilled from the head by the syphon dam discharges to the river at a point about 300 feet down-stream of power house.

The total length of the spillway is about 1,420 feet including vertical well, conduit, open canal and pipe. The well is 10 feet diameter, 29 feet deep, 3 feet thick, made of concrete with cut stone facing. The conduit is 115 feet long, 7 feet wide, 9.6 feet high from invert to arch crown, lined with cut stone, and built on 1 to 33 slope. The open canal, trapezoidal in form, is lined with rubble stone laid in cement mortar. The bottom width is 6 feet, depth 8 feet, and the side slope 1 to 0.5. The slope of the canal bed is divided in four parts. The first 67 feet has a slope of 1 to 0.5, the second 392 feet, 1 to 2.8 feet, the third 267 feet, 1 to 5.0 and the fourth 276 feet, 1 to 100. The pipe is 285 feet long, 6 feet in diameter, made of rivetted mild steel plate of three-eights inch thick.

## No. 1 Generating Station

(*a*) NAME, No. 1 Generating Station of the Inawashiro Hydro-Electric Power Company, Limited.

(*b*) SITUATION.—Nippashi-mura, Kawanuma-gun, Fukushima-ken, Japan.

(*c*) BUILDING.—Main building of the generating station consists of two parts: the generating and transformer rooms. The generating room is a single story steel frame brick building, 249 feet long, 66 feet wide, and 44 feet high, measured from ground floor to bottom of roof truss. The transformer room is a three story steel frame brick building, 249 feet long, 38 feet wide and 59 feet high from ground floor to bottom of roof truss.

(*d*) PENSTOCK. (1) Main Penstock.—Inner dia., four kinds of 2.25 m., 2.13 m., 2.01 m. and 1.9 m. from top to bottom.

Thickness.—Twenty-eight kinds from 10 mm. to 20.6 mm: length, 1,348 feet, average of six pipe lines: material, welded pipe made of Siemens-Martin mild steel: joint, bump joint: number, six pipe lines, of which one is spare. Maker, Thyssen & Company, Germany.

(2) EXCITER PENSTOCK.—Inner dia., four kinds of 0.8 m., 0.75 m., 0.7 m., and 0.65 m. from top to bottom: thickness, 8 mm. throughout: length, nearly 1,338 feet: material, welded pipe made of Siemens-Martin mild steel: joint, muff joint: number, one. Maker, Thyssen & Company, Germany.

(*e*) WATER TURBINES.—(1) Main turbine, type, horizontal Francis double spiral turbine: effective head, 104 metres: capacity, 11,250 h.p. at full gate opening: speed, 375 r.p.m.: number, six, of which, one is spare. Maker, J. M. Voith, Germany.

(2) EXCITER TURBINE.—Type, horizontal impulse turbine: effective head, 98 metres: capacity, 492 h.p. at full gate opening: speed, 500 r.p.m.: number, four, of which, two are spare. Maker, J.M. Voith, Germany.

(*f*) GENERATORS.—Type, totally enclosed forced draught horizontal shaft alternating current generator: capacity, 7,000 k.w.: power factor, 90 per cent.: phase, three phase: voltage, 6,600 volts: frequency, 50 cycles per second: speed, 375 r.p.m.: connection, star, the neutral grounded through resistance: excitation, exciting current is supplied from separate exciter plant: number, six of which one is spare. Maker, Dick, Kerr & Co., England.

(*g*) EXCITER.—Type, horizontal shaft direct current generator: capacity, 200 k.w: voltage, 250 volts: speed, 500 r.p.m.: connection, 2 wire system: excitation, shunt wound self-excitation: number, four, of which, two are spare. Maker, Dick, Kerr & Co., England.

(*h*) MAIN TRANSFORMERS.—Phase, single: capacity, 4,400 k.v.a.: voltage at high-tension side, 115,000 volts: voltage at low-tension side, 6,600 volts: frequency, 50 cycles: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, twelve, of which three are spare. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

(1) SWITCHING AND OTHER APPARATUS.—The switching apparatus and switchboards were made by the Westinghouse Electric & Manufacturing Company. Tirrill voltage regulators and Nicholson's arc suppressors are installed. There are one 55-ton and one 10-ton electric traveling crane, the former supplied by Jospeh Booth & Brothers, England, and the latter by Carrick & Richie, England.

## Power Canal for No. 2 Generating Station

The total length of the power canal, embracing one open canal and one tunnel, is nearly 3,990 feet. The cross section of the canal is adequate for the flow of 1,600 cubic feet of water per second with a grade of 1 foot in 1,500. A brief description of each section of the work, follows :

(*a*) HEAD WORKS.—This consists of an overflow dam across the river, and an intake for the power canal adjacent to the dam.

(1) DAM.—Type, overflow type with parabolic down stream surface: length, 110 feet: height, 225 feet from river bed: width, 8 feet at top and 31.6 feet at base: structure, concrete

with rubble stone facing: sluice gate, one stoney sluice gate, 9 feet wide and 9.6 feet high.

(2) Intake.—Situation, about 1,000 feet down stream from No. 1 power station: sluice gate, two hand or electrically operated stoney sluice gates, each 18 feet wide and 14 feet high: piers, concrete, with brick and cut stone facing.

(*b*) Tunnel.—Length, 2,220 feet: size, cross section of tunnel is horse-shoe shape, 17 feet in height and radius.

(*c*) Open Canal. Length, 1,770 feet: structure, concrete, thickness, 1.2 feet for side wall and 1 foot for bottom.

(*d*) Forebay.—Size and depth, 139 feet long, 81 feet wide, 19.29 to 22 feet deep: sluice gate, there are five hand and motor operated main stoney sluice gates for main penstock and a hand operated stoney sluice gate for the spillway. The size of each of the first five is 12.6 feet wide, while that of the latter is 4 feet wide and 4 feet high: structure, side wall and bottom are of concrete.

(*e*) Spillway.—The water spilled from the forebay by syphon dam discharges into the river. Length, 1,060 feet, including 129 feet tunnel: structure, concrete and rubble stone masonry.

## No. 2 Generating Station

(*a*) Name.—No. 2 Generating Station of Inawashiro Hydro-Electric Power Co., Ltd.

(*b*) Situation.—Nippashi-mura, Kawanuma-gun, Fukushima-ken, Japan.

(*c*) Building.—The main building of the generating station consists of two parts: generating and transformer rooms. The generating room is a single story steel frame brick building, 171 feet long, 66 feet wide, and 44 feet high, measured from ground floor to bottom of roof truss. Transformer room is a three story steel frame brick building, 205 feet long, 36 feet wide, and 44 feet high, from ground floor to bottom of roof truss.

(*d*) Penstock.—Inside diameter, 7.87, 7.4, 7.0, 6.5 and 6.0 feet: thickness, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ inches: length, 955 feet in average of five penstocks: material, rivetted mild steel: number, 5, including 1 spare. Maker, Tokyo-Ishikawajima Shipbuilding Co., Ltd.

(*e*) Water Turbine.—Type, horizontal twin spital Francis type turbine: effective head, 226.5 feet at full gate: capacity, 10,250 h.p. at full gate: speed, 375 r.p.m.: number, 5, including 1 spare. Maker, Kobe Works of Mitsubishi Dockyard & Shipbuilding Co., Ltd.

(*f*) Generator.—Type, totally enclosed forced draught horizontal shaft alternating current generator: capacity, 6,000 k.w: power factor, 0.9: phase, three phase: voltage, 6,600 volts: frequency, 50 cycle per second: speed, 375 r.p.m.: connection, star, neutral point grounded through resistance: excitation, excited singly with direct connected exciter: number, 5, including 1 spare. Maker, Shibaura Engineering Works, Ltd.

(*g*) Exciter.—Type, overhang type direct current generator: capacity, 65 k.w.: voltage, 250 volts: speed, 365 r.p.m: connection, 2 wire: excitation, self-excited shunt wound with interpoles: number, 5, including 1 spare. Maker, Shibaura Engineering Works, Ltd.

(*h*) Main Transformer.—Capacity, 4,400 k.v.a: phase, single phase: voltage at high-tension side, 115,000 volts: voltage at low-tension side, 6,600 volts, with two 2.5 per cent. low voltage taps: frequency, 50 cycles per second: connection, delta connection in both high and low-tension sides: cooling, oil immersed water cooling: number, six. Maker, Shibaura Engineering Works, Ltd.

(*i*) Switching and other Apparatus.—All switching apparatus and switchboards were made by the Shibaura Engineering Works, excepting the 115,000 volt lightning arresters from the Westinghouse Electric & Mfg. Co. There is one 50-ton overhead traveling crane made by the Tokyo-Ishikawajima Shipbuilding Company. A special device is used for inter-connected voltage regulation of No. 1 and No. 2 generating stations.

## Transmission Lines

There is one 115,000 volt transmission line between No. 1 generating station and the Tabata receiving station, and between No. 1 and No. 2 generating stations, also, one 6,600 volt transmission line between No. 1 and No. 2 generating stations.

(*A*) 115,000 Volt Transmission Line.—(a) Length, between No. 1 generating station and Tabata receiving station, 140.1 miles: between No. 1 and No. 2 generating station, 1 mile.

(*b*) Conductor.—Size, seven strand of 168 mill wires, nearly 0.51 inches outside diameter, 197,600 circular mills in cross section: material, hard drawn copper: number, six cables are strung on one tower making up two 3-phase 3-wire circuits: sag, for standard span of 550 feet, at maximum temperature, the clearance of the lowest cable above ground is 27.7 feet and sag of the cable is 15.73 feet: arrangement, six cables are arranged in two vertical rows, having the middle cables placed 2 feet outside the rest. Horizontal distance of two rows at the middle cable is 23 feet 6 inches in A tower and 24 feet 6 inches in B and C towers. Vertical distance of adjacent cables is 10 feet for all standard towers: transposition, no special transposition tower is used. Maker, Furukawa & Co., Japan.

(*c*) Ground Cable.—Size, seven strand of 125 mill wires, about $\frac{3}{8}$-in. in outer diameter: material, galvanized Siemens-Martin steel: number, two on one tower: arrangement, two ground cables are fixed at both ends of top arm, 19 feet 6 inches apart at A tower and 20 feet 6 inches apart B and C towers. Maker, Roebling & Company, U.S.A.

(*d*) Towers.—There are three standard types of towers:

Standard Tower "A": A towers are to be erected at points where lines are straight or turn at an angle less than six degrees. Conductors are suspended by the use of the suspension insulators and ground cables fixed at the top arm.

Standard Tower "B": B towers are of special strength to bear the strain of all six conductors and the two ground cables. They serve for diminishing the vibration of conductors and also to prevent any extension of damage to the tower line when any one of the A towers fail. They are erected at every twentieth tower, and at points where the line angle exceeds thirty degrees. Conductors are secured by the use of strain insulators, and ground cables fixed at the top arm.

Standard Tower "C": C tower, is a still stronger tower, designed to resist the transversal pull on line angles of thirty degrees, and are used at points where the line angle is more than six degrees but less than thirty degrees. Conductors are fixed by the use of strain insulators, and ground cables fixed at the top arm.

Special Tower: Besides the above-mentioned three standard towers, there are many special towers for crossing rivers, such as Tone, Kinu, Ara, etc., and for crossing extra high-tension transmission lines belonging to other companies.

A rough description of the tower is as follows:

Standard Span, 550 feet: actual average span, 516 feet: longest span, two 1,530 feet making total length at 3,060 feet (crossing the River Tone): material, galvanized mild steel, with sherardized bolts: height, A tower, 72 feet 9 inches; B tower, 72 feet; C tower, 72 feet: base, A tower: square of 18-ft. $8\frac{10}{16}$-in. side; B tower: square of 19-ft. $7\frac{1}{4}$-in. side; C tower, square of 19-ft. $7\frac{1}{4}$-in. side: weight, A tower, 5,890-lbs. (excluding anchorage); B tower, 12,160-lbs. (excluding anchorage); C tower, 9,900-lbs. (excluding anchorage).

Foundation.—Towers are set on galvanized mild steel anchorge. Where the bearing power of soil is not strong enough, concrete and piling are to be added. Weight of anchorage is as follows: A tower, 803-lbs.; B tower, 4,413-lbs.; C tower, 2,858-lbs.

No. of Towers.—Number of towers erected is as follows: A tower, 1,128; B tower, 112; C tower, 175: special tower, 34: total 1,449. Maker, American Bridge Company, U.S.A.

(*e*) Insulators.—Type, suspension type: Material, porcelain: number of units per string, seven for suspension insulator, eight for strain insulator: size, diameter of shell, 12 inches. Distance of centres of connecting pins, 5½-in.: test voltage, dry test: 70,000 volts for 5 minutes for one unit. 380,000 volts for 1 minute for seven units, in one string.

West Test: Under a jet of distilled water directed at 45 degrees to the string, at the rate of precipitation of 0.2 in per square inch per minute. 45,000 volts for 5 minutes for one unit. 290,000 volts for 1 minute for 7 units in one string: mechanical test, under tension of 5,000-lbs. on sign of yielding allowed, but it breaks at above 10,000-lbs. Makers, R. Thomas & Son Company, U.S.A.; Nippon Insulator Co., Ltd.; Shofu Insulator Co., Ltd.

(*f*) Switching Stations.—Three switching stations are installed along the transmission line, spaced nearly equally at Shirakawa, Utsunomiya, and Koga, for the purpose of exchanging the sections of the circuits. The installations are of the outdoor type, provided with hand operated oil switches. The switching apparatus was supplied by the Westinghouse Electric & Mfg. Co., but the switching tower structure was made by Ishikawajima Iron Works, Tokyo, Japan.

(*B*) 6,600 Volt Transmission Line—(*a*) Length, 1 mile: conductor: size, seven strand of 168 mil wires, nearly 0.51 inches in outside diameter, 197,600 circular mils in cross section: material, hard drawn wire: number, 6: dip, maximum dip at standard span of 150 feet is 2.5 feet: spacing, interaxial distance is 2.15 feet. Maker, Furukawa & Co., Ltd.

(*c*). Pole.—Standard span, 150 feet: maximum span, 192 feet: construction, the support is H form wooden pole using two creosoted *sugi* (a kind of cedar) poles of 32 feet length and 7¾ inch top diameter. The interaxial distance of poles at ground level is 5.4 feet and that at the top is 4.25 feet, and bottom of pole is 6 feet below ground level. Two 7-foot galvanized angle iron cross arms are attached to the poles at the points 1 foot and 3.25 feet below the top.

(*d*) Insulator.—Type, three petticoat pin type insulator: material, porcelain: size, maximum diameter, 5½ inches: height, 4¼ inches: dry flashover voltage, over 55,000 volts. Maker, Nippon Insulator Co., Ltd.

(*C*) Telephone Line.—A separate telephone line is installed between generating and receiving stations and between generating stations, along the route of main transmission line. This telephone line comprises three 2-wire circuits as follows:

Circuit No. 1, for direct communication between the stations: No. 2, this is divided into two sections at Utsunomiya switching station, the middle point in the line. The first section is for communication between the generating station and Utsunomiya switching station, and the second section is for use between Utsunomiya switching station and Tabata receiving station. These two sections can be interconnected at Utsunomiya, with each other or to any one of No. 1 or No. 3 circuits, when necessary: No. 3, this is divided into four sections at three switching stations. Each section is for communication between adjacent switching stations and patrol men.

A brief description of the construction of this telephone line is as follows: Standard span, 180 feet: standard pole, 24 feet, Sugi pole, 6 inches in diameter at top end: Atm, Nara, impregnated with creosote: insulator, porcelain, double petticoat insulator: conductor, hard-drawn copper wire weighing 200-lbs. per mile: ground wire, one S.W.G. No. 8 galvanized iron wire is fixed at top of pole and connected to earth wire of it.

For special long spans crossing rivers, etc., special pole and copper clad steel wire are used. Besides heat coils, arresters and fuses, drainage coils and telephone transformers are installed as safety devices for the telephone instruments.

## Tabata Receiving Station

(*A*) Name.—Tabata Receiving Station of Inawashiro Hydro-Electric Power Company, Limited.

(*B*) Situation.—Near Tabata Railway Station, Tokyo, Japan.

(*C*) Building.—There are two main buildings, i.e., transformer and switch house and synchronous condenser house. The first is a three story reinforced concrete building, 144 feet long, 85 feet wide, and 57 feet high from ground floor to bottom of roof truss. The last consists of the synchronous condenser room and switch room.

The synchronous condenser room is a single story brick building, 96 feet long, 40 feet wide, and 32 feet high from ground floor to bottom of roof truss. The switch room is a two story brick building, 21 feet long, 40 feet wide and 32 feet high.

(*D*) Main Transformers.—Phase, single phase: capacity, 4,000 k.v.a.: voltage at high-tension side, 100,000 volts: voltage at low-tension side, 11,000 volts: frequency, 50 cycles per second: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, twelve, of which three are for spare. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

(*E*) Auxiliary Transformers.—These transformers are for supplying power to small consumers in the neighborhood of the station. They are as follows:

Phase, single: capacity, 500 k.v.a.: voltage at high-tension side, 11,000 volts: voltage at low-tension side, 3,300 volts: frequency, 50 cycles: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, nine, of which three are spare. Maker, Shibaura Engineering Works, Tokyo, Japan.

(*F*) Synchronous Condenser.—Type, totally enclosed forced draught horizontal shaft synchronous condenser: capacity, 7,500 k.v.a. continuously and 9,000 k.v.a. for two hours: power factor, 0: phase, three phase: voltage, 11,000 volts: frequency, 50 cycles per second: apeed, 500 r.p.m.: connection, star: excitation, excited singly with direct connected exciter: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*G*) Exciter of Synchronous Condenser.—Type, overhang type direct current generator: capacity, 60 k.w.: voltage, 250 volts: speed, 500 r.p.m.: connection, 2-wire system: excitation, self-excited shunt wound generator with interpoles: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*H*) Starting Motor of Synchronous Condenser.—Type, alternating current three-phase wound rotor induction motor: capacity, 300 h.p.: voltage, 3,300 volts: frequency, 50 cycles per second: synchronous speed, 600 r.p.m.: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*I*) Switching and other Apparatus.—All the switchboard and switching apparatus was made by the Westinghouse Electric & Mfg. Co., excepting those for the synchronous condenser, made by the Shibaura Engineering Works.

There are one 40-ton and 1-ton overhead traveling cranes for main transformers and synchronous condensers respectively. The former is from the Whiting Foundry Co., U.S.A., the latter from the Tokyo-Ishikawajima Shipbuilding Company.

For testing insulators, etc., two testing transformers with necessary accessories are installed. Description of the testing transformers is as follows:

Phase, single: capacity, 150 k.v.a.: voltage at high-tension side, 360,000 volts: voltage at low-tension side, 2,000 volts: frequency, 50 cycles per second: cooling device, oil immersed self-cooling: number, 2. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

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Material for two long-distance telephone lines has recently been shipped from Chicago to Japan by Western Electric Co. They will afford the first modern long telephonic communication system in the Japanese empire, one between Tokyo and Yokohama and the other between Osaka and Kobe. In the two cables are 55,000,000-ft. of copper wire weighing 350,000 pounds. The lead sheath used to encase the copper strands weighs more than 1,000,000 pounds. Cost is about $750,000.

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# A New Japanese Attitude Towards China

AS one result of the prolonged anti-Japanese campaign, foreigners in China may have the satisfaction of calling upon their own governments for protection should the present political and military situation develop into a menace to foreign lives and property. No longer can the foreigner secretly cherish the hope that if the worst should come, Japan will act as the policeman of other nations in China. If internal disorders ever reach a stage where large bodies of foreign troops are required to protect foreign lives and properties, other nations must be prepared to incur the expense of dispatching and maintaining troops and assuming their full share of the after consequences with the Chinese people. Never again will Japan permit herself to be placed in a position where the presence of her troops in Chinese territory can be misinterpreted and so create suspicion and fear of her motives in the minds of the Chinese.

In view of the menacing outlook in the north and the general unstable conditions prevailing in other parts of China, it is well to pause and consider the effect of such a policy on the future relations between China and other countries. The consensus of opinion in Japan, both in official and commercial circles, is that Japan should hold aloof from intervention in China except that which might be absolutely essential for the protection of their own interests, and, even this should be undertaken only as a last resort. If conditions should unfortunately warrant the dispatch of foreign troops for the protection of lives and properties in China, the initiative will have to be taken by the other powers, so that no misunderstandings can be created in the minds of the Chinese as to Japan's position. The diplomatic corps at Peking has warned the Chinese government that in the event of grave disorders breaking out in the north, troops will be dispatched for the protection of the interests of their respective nationals. Restrained by an overwhelming popular sentiment that the time has arrived when a stop must be put to the further dispatch of troops into China and Siberia, the Japanese government will simply follow the initiative of the other powers. The Japanese people are "fed up" with these expeditions, and there is reason to believe, that they would prefer to have their nationals residing in the danger spots in China, concentrated in the ports, than be called upon at this juncture to send any large body of troops into the interior for their protection. They incline to the belief that if China's much discussed sovereignty is to be recognized and her government placed on a secure basis, the Chinese must be permitted to work out their own problems in their own way, free from undue outside pressure.

Highly placed Japanese seem to believe that the struggle between Wu Pei-fu and Chang Tso-lin places them in a most embarrassing position. It is no secret that foreigners have extended material and moral support to Wu Pei-fu, the "Hope of China," because of the suspicion that Chang Tso-lin is an instrument of Japan. These Japanese repudiate any direct connection between their government and the over-lord of Manchuria, who, they assert, has been able to attain his present strong position because of the fact that the provinces under his rule have enjoyed great prosperity as the result of Japanese initiative and enterprise, made possible by the presence of their railway guards insuring protection of the properties against bandit raids and unscrupulous tax gatherers. Chang, they say, is pro-Japanese only in so far as it suits his convenience to be so, the real link of understanding being one of appreciation arising out of the fact that whenever he requires extra funds, the resources of the Manchurian provinces can be relied upon to provide them without undue injury to their productivity. Chang Tso-lin, they declare, is not pro-Japanese or pro anything. Like every other Chinese leader he is out for himself, first, last and always. He is pro-Chang. These conditions have been exaggerated, say the Japanese, into the report that Chang is the instrument of Japan, which has provided foreigners with arguments which inclined them to extend moral and material support to Wu Pei-fu, not because the latter is any more patriotic or less of an adventurer than Chang, but because of their opposition to the spread of Japanese influence in China.

There can be little doubt that there exists considerable justification for the holding of such opinions in Japan, and there are equally strong reasons which justify foreign opposition to Chang Tso-lin. The free circulation of these reports has undeniably contributed to lining up opinion in China on the overworked issue of Japanese domination of the country through control of its government.

This anti-Japanese aspect of the present struggle for power is commented upon by nearly all the leading Japanese newspapers, who see in the warning of the diplomatic corps that the Peking-Mukden line must not be used for the transport of troops, a direct blow to Chang Tso-lin and a corresponding advantage to Wu Pei-fu. The *Tokyo Nichi Nichi* sensing this possibility, declares that if the action is traceable to a desire to assist Wu Pei-fu, it would prove the fickleness of the policies of other governments towards China, and then goes on to emphasize the real point at issue. Foreign intervention in the affairs of China at this time, which in any way obstructs the Chinese from solving their own problems in their own way, by providing undue advantage to any one faction will create a precedent that will deprive China of the advantages secured at the Washington conference. The theory that China's salvation must come from within will receive a rude set-back.

The outlook is not encouraging. If left to the Chinese to settle their own difficulties, it may take many years before the country is unified under a stable government. Foreign support either moral or material to any of the warring factions can serve only to make more difficult the protection of foreign lives and property in the interior. Little reliance can now be placed on the Chinese for such protection. From all parts of the country come reports of utter disregard of the rights of foreigners and refusal to pay adequate damages for properties and lives destroyed. The situation in Harbin has taught them that contempt for the foreigner can be practiced with impunity.

The tendency in Japan to keep aloof from intervention in the affairs of China and permit the warring factions to fight it out amongst themselves is, therefore, well worthy of serious thought. If conditions in this country should ever become so intolerable as to warrant the presence of foreign troops to protect lives and property we may well ponder over the number of divisions that would be required to properly police the territory adjacent to the main treaty ports. If present Japanese sentiment holds good in such an emergency (and there is every indication that they will refuse to shoulder any obligations other than those shared equally by all) it is time that other foreigners should ask themselves where all this is leading to. Japan has been maligned and traduced, suspected and accused of every ulterior motive that human ingenuity could think of, because, in the past, she has taken immediate steps for the protection of her interests whenever they have been placed in jeopardy through Chinese disorders. The Chinese have been carefully educated to believe that in the event of any serious internal disorders jeopardizing the lives and properties of foreigners, Japan would seize the opportunity to flood the country with troops, and, in pursuit of her policy to dominate China, would never withdraw until the government was firmly under her control. This belief has taken a firm root in the minds of the Chinese, in evidence of which, only a few weeks ago, the Chinese chamber of commerce of Shanghai sent a telegram warning the Peking government against the possibility of Japan postponing the withdrawal of her troops from Shantung on the pretext of maintaining order there should war break out between the Chihli and Mukden factions. The bogey of Japanese armed intervention was calculated to frighten the Peking government into finding, at all hazards, a peaceful solution to the present situation.

The Japanese have learned their lesson. They decline to be made the policeman of China, and in the event intervention becomes necessary, it may be taken for granted that they will refuse to assume any obligation not shared equally by all other powers. Once the Chinese learn that they have little to fear from Japanese armed intervention in the event of internal disorders incidental to political unification; once this overworked bogey is eliminated from the scene, the consequences must strike home to of every thinking foreigner in the country.

We have put China to the test. If she fails to live up to our hopes and expectations and provides cause for armed intervention during the period of unification and reconstruction, public opinion in Japan will insist upon its government holding aloof as far as compatible with their actual interests, and permit other nations to apply their own remedies in their own way. The Japanese have learned that even if they should be called upon at a time of great stress to come to the rescue of foreigners in China, as soon as the danger is passed, gratitude would be replaced by distrust and the same agitators who launched the last anti-Japanese campaign would move heaven and earth to discredit their motives and shift the responsibility for intervention on to their shoulders. If trouble comes, other nations must be prepared to meet it fairly and squarely by the dispatch of their own troops. The people of America and Britain who will be called upon to foot the bills should be told the truth. If armed intervention in the affairs of China is to be the culmination of years of misrule and civil strife, it is well that both Chinese and foreigners alike should thoroughly understand the present trend of opinion in Japan, and prepare accordingly.

* * *

# The China Trade Act

IT has taken two years of hard work to get the "China Trade Act" into conference. The strongest argument in its favor was the placing of American companies on a plane of equality with those of other nations operating in China, which, stripped of superfluous verbiage, means exemption from federal taxes in order to compete with similarly favored British China companies. The strongest opposition to the bill emanated from the fear of home manufacturers that Chinese capital would incorporate under the law, using American citizens as a means to procure American protection and exemption from both Chinese and American taxation.

The most powerful argument advanced in support of the bill, was based on the favored position of the British companies, and the statement that Chinese capitalists, eager to co-operate with Americans in the establishment of new industries, were restrained from so doing, because they could more profitably invest in the tax-empted British concerns. This, of course, put a decided crimp into any hope of bringing about American-Chinese cooperation in the development of China's resources. The advocates of the bill, however, insisted that the British were favored by a special policy of their government who granted this exemption as a means of assisting British firms to capture the trade of China. In this, we are inclined to believe that a great mistake was made, much time and effort wasted, and the bill placed in jeopardy through misunderstanding, all arising from an immature knowledge of the facts surrounding the British position. The advocates of the bill simply jumped to certain conclusions, and in so doing, injured their own chances of success and placed the British in a false position before the American people.

The British position on tax-emption for registered companies and British subjects in China, far from being traceable to any secret policy of their government to favor its nationals in the fight to dominate Chinese trade, strange to relate, is based on a clear cut principle, one which lies at the very foundation of American liberties and conception of government.

The British position was very clearly set forth two years ago, when the British chambers of commerce in China voted to petition their home government to impose taxation on British firms and subjects in China, in order that they might contribute their share in paying the huge costs of the war. A most patriotic and laudable spirit. However, in the discussions which followed, one of the leading British jurists in China expounded the principles underlying the exemption from taxation and explained that "the proposal to levy an income tax on British subjects in China as a separate tax to be levied by the British government has to get over a great number of difficulties. In the first place we have to recognise that we enjoy extraterritorial rights in China, but no right is given to the British government to tax British subjects in China, which might amount to an infringement of China's sovereign rights.

"You will bear in mind that at present there are no taxes. There are certain fees payable, but all those fees are regarded strictly as fees for services rendered and not as taxes at all. In order to impose a tax on British subjects in China it would first be necessary to assume that such a thing would be allowed under the treaties, because the only ground upon which the king in council exercises his jurisdiction, is ground set out under the foreign jurisdiction act of 1890 for the purpose of carrying out the provisions of treaties."

"The foreign jurisdiction act gives no right to levy taxes and no right can be given to levy taxes, except by parliament. That is very clearly laid down in the bill of rights under William and Mary in 1688. Would parliament ever give authority to the British government to levy taxes on British subjects without those subjects having a right to representation ? It is always agreed that taxation without representation is something entirely contrary to the British constitution. We must bear in mind that if we ask for income tax to be imposed on us, we might have to meet, not such a small tax as we contemplate. When once we accepted that tax, we should take a step from which we could never go back and if the government next year liked to raise it to 5s. we should have nothing to say, because we should have established their right to do so. Once we admit the principle, a principle which is outside the British constitution, we admit something which might cause us endless trouble in the future."

After perusing the mass of evidence submitted before the congressional hearings on the "China Trade Act," it is refreshing to read these words from a British jurist, in explaining a principle which influenced the American colonies to declare their independence in 1776. The American people may not understand all the technical trade and other arguments for or against the "China Trade Act," but they can be depended up to grasp in a minute and demand the passage of a bill based on such principles.

It is a sad commentary on American politics that at this late date, we find the British resolutely defending the principle of "no taxation without representation," and adhering strictly to the treaties with China, while these same principles have been overlooked and ignored by Americans in the contest over a trade act, in order to compete with British companies operating on a principle their government dares not defy. There ought to be a lesson in this to the advocates of the "China Trade Act," and if the bill sticks in conference and is unduly held up, it might not be a bad idea to change the tactics and approach congress and the people of the country, on the principle involved in the British position.

# The Kiangsi Railway Loan

## China's Commercial Honor at Stake

THE Japanese chargé d'affairs recently dispatched a note to the Waichiaopu urging the payment of three instalments of overdue interest on the Kiangsi Railway loan, adding that unless paid by August, the creditor, the East Asia Development Company, will be obliged to take over control of the line in accordance with the terms of the loan agreement. This railway, about 80 miles long, connecting Kiukiang with Nanchang, the capital of Kiangsi province, has been in constant financial difficulty since its construction was first started. The amount owing to the Japanese company is about $2,500,000 silver, and owing to mismanagement and the other mal-practices peculiar to the operation of private Chinese railways, the company has been unable to pay the last instalments of the interest due. With the menace of foreclosure and Japanese direction, the officials of the company have been active the past year in attempting to raise funds to meet their obligations. The line itself is merely the first section of a provincial system, the concession for which is held by the company under a provincial charter, and cannot be expected to pay until extensions are built south and east from Nanchang, connecting the Yangtze with Canton, Swatow or Foochow. It was proposed last year by the president of the company that a new and larger loan be entered into with the Japanese in order to absorb the old one and provide for these extensions, but apparently, the latter are in no mood to advance further sums, under the present administration of the line and the unsettled political conditions prevailing in the province.

Unless the Chinese can raise the funds to meet this obligation, the warning of the Japanese chargé d'affairs, indicates that the creditors will, after a due period of grace, proceed to take over control. This is the only instance where a Chinese railway in operation has been mortgaged on the security of the physical properties and revenues of the lines. In all the old railway agreements, in order to eliminate the possibility of foreign control in the event of default, the Chinese allocated other revenues as security for the loans. In the Pauling and Siems Carey contracts, the line and revenues are pledged, but as these remain on paper, the issue of intervention on default of payment of interest has never before arisen. Here we have a case that will test the sincerity of the Chinese towards these matters. The onus of taking over control of a Chinese railway, with all that this implies in the minds of the Chinese towards their sovereign rights, will have to be borne by Japan, and it is to be expected that any step taken to execute the terms of the contract will be misinterpreted and the truth distorted in order to create suspicion of Japan's motives in the minds of the Chinese. The situation is, therefore, one of considerable interest to all concerned in the development of China, especially at a time when Sir Charles Addis, head of the British group in the consortium, is advocating the opening of negotiations with the provincial governments as a means of solving the present consortium deadlock. Provincial revenues, like all those pertaining to Peking, have been diverted into the pockets of the *tuchuns*. In many instances, taxes have been paid in advance for a term of years, in order to satisfy the craving of the insatiable military satraps. An example of how far the receipts from legitimate taxation have fallen off in the provinces and municipalities is seen in the publication in our February number of the budget of the city of Canton. Out of a total budget of $2,000,000, twenty-five per cent. is derived from the "sing-song" girls, and fifteen per cent. from the rickshaw coolies, a total of forty per cent. from sources that indicate in no uncertain manner, the desperate need for revenue. If this is the condition in a city which, we are assured by all competent witnesses, is a model in municipal government in China, what must be the conditions in other cities dominated by grasping military chieftains ? It would seem to indicate that reliable provincial and municipal revenues that might serve as security for railway or development loans, are difficult to find.

The issue involved in the payment of the Kiangsi Railway loan is, therefore, one that should merit the close attention of foreign financial interests. The province, to all appearances, is sucked dry. It cannot come to the aid of its own railway. The central authorities are in a similar plight. Foreclosure, or foreign control of a security, has to be faced. It is the only tangible asset left to the Chinese on which they can hope to interest foreign capital in their development. If, when the time arrives to take over control on default of payment, the Chinese object, what then is left for them to offer as a guarantee of good faith ?

The treaties entered into as the outcome of the Washington conference relieves China from any fear that the Japanese government or its private enterprises will harbor political designs in pressing for their just rights. The old fear of political penetration through control of railway lines cannot now be fairly advanced as a reason for the non-compliance of the loan terms. The contract rests squarely on its merits as a business proposition, and cannot be shirked by an appeal to political passions. The future of foreign investments in China is at stake on the outcome of this situation.

* * *

# The Railway Aspect of the Consortium Organization for China

(*Contributed*)

FROM the railway point of view, realization of the consortium ideals will bring to China the following desirable changes:—

The total abolition of spheres of influence, the provision of an adequate railway system, and improved methods of operation with its corollary standardization.

These results are contingent on the assumption that the consortium terms will be accepted by the Chinese government. Until then, interest in the consortium must remain academic. At present, China shows no inclination to agree, considering her sovereignty endangered by the demand for supervised disbandment of her army, an absolute necessity for the security of any new loan.

That the sovereignty agitation is inspired, goes without saying, as disbandment means an end to the clique of military autocrats now ruling the country. There is no means of coercing these brigands, who, blind to China's interests and bent only on amassing vast private fortunes, are fast ruining the country by maintaining troops out of all proportion to the country's needs. China is perpetually on the brink of civil war as her soldiery owe allegiance only to the men who maintain them in licentious ease, men who would not hesitate to use this power for purely private ends. China is in a condition of rampant feudalism and nearing a first-class catastrophe. There must be a limit to increased taxation to support the armies, and with the new solidarity in financial matters which the consortium spells, there will be no chance for the honest broker among jealous and greedy powers such as gave Tang Shao-yi his opportunities in the first consortium negotiations of 1912-13.

In China, as elsewhere, the natural corollary to an empty treasury is mutiny, revolution and the rise of a strong man. Bankruptcy also implies more stringent foreign control of such organizations as the customs, salt gabelle, and certain railways built with foreign loans.

The hopelessness of the financial situation needs no emphasis, when it is recalled that China has recently defaulted in the matter of a comparatively small loan made by American finance. It would appear, therefore, that the consortium terms must be accepted sooner or later. These terms would embrace disbandment of the standing armies; re-union of the North and South and assignment of part of the loan to the South; supervision of loan expenditure by consortium representatives; pledging of the salt gabelle and customs to guarantee repayment.

This article pre-supposes the creation of a railway service somewhat on the lines of the customs and salt gabelle, a logical corollory of the pooling of the various national interests. The original proposals emanating from Chinese sources were for the consolidation of the capital of the various foreign-built railways into one joint loan, indicating that this idea would not be repugnant to China. In this case, everything would be centralized in Peking under one man to the lasting benefit of the country and the elimination of much unnecessary personnel from the conduct of railway affairs. If the consortium is bent on assisting China to rehabilitate herself, foreign control of the railway policy must be insisted on. Foreign direction is needed to see that there is no unnecessary railway construction and also to ensure the proper development of, and additions to, existing lines out of revenues.

At present, the vital railway needs of the country are limited to the completion of the Canton-Hankow Railway, in order to unite the North and South, prevent the recurrence of further factional disturbances and open up a district of vast industrial possibility. The Hankow-Szechuan Railway is equally important to the general welfare, for the better maintenance of law and order in the isolated province of Szechuan and for the development of that enormously wealthy province. With these two most expensive projects completed, attention should be turned to the development of a national steel industry, simply from the point of view of obtaining cheaper steel for railway construction. When it is recollected that fully thirty per cent. of the pre-war cost of railways in China was for products in which steel is the essential material and that this ratio will now be more than doubled, the importance of this development needs no urging. China should be able to produce the cheapest steel in the world. At present nearly all the ironworks in the country are either mortgaged to Japan or in Japanese hands and Japan herself needs all their output.

Lastly, from a purely humanitarian point of view, the regulation of the Huai River, and the conservation of the Grand Canal and Yellow River are of first-class importance as they constitute in their present condition a perpetual menace to the lives, property and crops of many thousands of people.

With the completion of these very urgent projects and the inauguration of an era of most rigid but wisely directed economy, it is believed that China, could, from the profits of the railways in existence, very quickly create an adequate railway system. Foreign direction, and above all, strong governmental support of that direction, are an absolute essential, unless China can produce a man worthy of consortium trust.

Spheres of influence, now happily eliminated by the Washington conference, have cost unhappy China untold millions for railways alone, for these must now be constructed at a cost vastly increased by war conditions, while the delay to education and the advent of that era of profound peace so absolutely necessary for recuperation cannot be estimated.

With regard to the question of an adequate railway system, the following figures are instructive as comparisons with other countries; the Indian figures being particularly striking as conditions and needs are somewhat similar.

The total mileage of railways of all classes, government, concession and private, is 6,836, giving for exch mile of line a population of 100,000 people and 460 sq. miles of territory. The United States has for each mile of railway 3,800 people and 12 sq. miles of territory, while India has 8,600 people and 40 sq. miles of land for each mile. Thus, to bring China up to Indian standards, China has yet to construct some 29,000 miles, a figure giving some idea of the colossal nature of the consortium undertaking and its possibilities for world trade.

The above comparisons do not, however, represent the true position *vis-à-vis* other countries, for elsewhere road construction has gone hand in hand with railway construction and with the vast development of motor traction are increasingly used as an adjunct to railways. China, however, is entirely without a road-way system and its need of railways therefore all the more urgent, from every point of view.

To the handicap of bad roads, must be added the hampering effect of many dialects, the presence of numerous *likin* or native custom stations each levying a dole fixed by the needs of the local magistrate; and the risk of pillage by banditti, ever on the increase since the revolution. The following statements will cause no astonishment. Outside the railway zones the grossest superstition still prevails which can be, and is, often worked upon to retard progression. Ignorance is appalling and abysmal, and the outlook of the country people limited by the exigences of a grinding poverty and the struggle for the barest existence. Only purely local needs are manufactured for; standards of length, coinage and capacity, vary from village to village and there may be surplus in one district and famine in the next. There is no patriotism of a large kind and village welfare is of such paramount importance as to obscure all larger issues. With no press or politics the outlook of the coolie class is limited by interests of birth, marriage, death and above all, crops. These factors in the Chinese problem need serious consideration by those who would embark on development work in China. For such, strong government backing is an absolute essential to success, as the unhappy fate of many past enterprises proves.

On the question of improved operation, the following facts are illuminating. Thus, in the board of communications' (1919) report it will be found that 16 railways are concerned with a total mileage of 3,750. For these there are 17 practically separate administrations, the Tientsin-Pukow Railway having two as the line was constructed under a joint Anglo-German loan as traversing two spheres of influence. Yet the total mileage of the whole line is 688. There are other more flagrant instances such as the Taokow-Chinghua and the Chengtai railways with mileages of 95 and 151 respectively, which obviously should rank as branch lines, were it not for loan agreements which demand independent administration, an expensive and absurd arrangement which centralization following Consortium control will eliminate. Contrast such practice with the Cape government system with 9,500 miles under the control of Johannesburg.

As regards the board of communications itself, the following reform should result as a corollory of consortium control. At present, the position of board officials and many more prominent outside railway employees, is assured only so long as their party remains in power. With a new cabinet, in all probability there will be a clean sweep of the old *régime*, a procedure not calculated to promote either efficiency or intelligent interest in the work of the board and eminently conducive to corruption. It must be remembered that an official once out of employment is, caste and face reasons aside, not often fitted for commercial life—the only prospect open to him. He must, inevitably adopt *carpe diem* tacties while in office to the exclusion of all else, for official pay of all but higher posts is totally inadequate to acquiring a competence. The present system cries for reform and the creation of a picked permanent staff in such a specialised department as the railway board indubitably essential.

Again, with regard to board railway policy, a radical change is essential. At present, the railways in operation are starved of all but vital maintenance needs and there is consequently no development of open lines, every one of which is capable of handling a vastly increased traffic, which the building of feeder lines would ensure. No single railway* in the country has yet reached the maximum capacity for single line traffic, yet no branches are built. During the year 1918, the profit on the government railways was over 33 million dollars, over 10 per cent. on the invested capital, yet the mileage added during the year was only 18. Previous years would not exceed this and although years of war, the contrast with Indian (pre-occupied with the creation of a railway system for Mesopotamia) is singularly unfavorable. During the years 1914 to 1918, the mileage of the railways of India was increased by 1678, this in a country with a well-established road system and no such crying need for better communications as China.

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*The Peking-Mukden Railway is being double tracked over a length of 80 miles.

This stagnation is in no sense the fault of the board but merely a corollory of *tuchun* or militaristic government which makes insatiable demands on every source of income. Thus, in the budget for July 1919 to June 1920, totaling some 645 million dollars, military expenditure is estimated at 40 per cent. Anyone with any military knowledge or even a laymen who observed the conduct of Chinese troops in the recent factional fight between the Anfu and Chihli parties, would have no hesitation in condemning the vast majority of China's army as an undisciplined rabble, totally devoid of every quality making for military efficiency, skilled only in the gentle arts of pillage and senseless destruction, bashibazouks without the redeeming quality of a fierce courage. Rigidly supervised disbandment of these uniformed pests is a necessary preliminary to all reform and the first great work of the consortium will be to terminate this useless and wasteful swashbuckling and ensure that a non-military country, where all progress hinges on communications, is not in future disgraced by a budget which allocates one per cent. of its receipts to education and ¾ per cent. to industrial development. In future, railway surplus must be earmarked for railway development.

To similar causes must be ascribed the rolling stock shortage which is still acute. The railways as a whole are hopelessly under-equipped when contrasted with Indian and other railways and the tonnage offering is continually on the increase. The table shows the contrast in this respect between India and China for three principal lines:

| India | Wagons per kilometre | Engines per kilometre |
|---|---|---|
| Bengal-Nagpur | 5 | 0.17 |
| B.B. & C.I. | 0.42 | 0.18 |
| East Indian | 7.8 | 0.57 |
| China | Wagons per kilometre | Engines per kilometre |
| Tientsin-Pukow | 1.26 | 0.103 |
| Kin Han | 1.95 | 0.137 |
| Peking-Mukden | 3.52 | 0.242 |

Consortium control will render impossible mismanagement of loan funds such as occurred during the construction of the Ningpo-Hangchow Railway when native companies were allowed to squander £1,500,000 of borrowed money for which the central government was liable, on the construction of a line, which, even with this aid, they were unable to complete and which had eventually to be taken over by the government and handed over to the management of the Shanghai-Nanking Railway for completion and re-construction.

Such wholesale peculation as occurred during the construction of the German section of the Tientsin-Pukow Railway should not be possible in future, together with such diversion of loan funds for industrial purposes as frequently occurred during the war, when Japan financed China without restriction for most questionable considerations. More particularly, the making of such contracts as the car purchase† agreement with Japan on behalf of the Tientsin-Pukow Railway, should, in future, be out of the question, just as much as the creation of monopolies of supply to government departments which was also attempted during the war.

Finally, the question of standardization needs emphasis. As things are at present, though such essentials as render car interchange possible on the government railways have with one exception‡ been provided for, in constructional details generally, the ideas of the country financing the enterprise have as a rule prevailed. The consequence is that each administration has its own standards, a factor tending to restrict car interchange, as repairs are not feasible away from the home line. This tendency to multiply standards has been accentuated by the recent war which made America the only possible market, and though, as a rule, efforts were made to preserve uniformity, it was difficult to fully meet the required specifications.

Standardization, though most vital in the case of rolling stock, is urgently needed in all departments and a commission of foreign experts appointed in 1919 is now advising the board of communications on this question. With the larger question of inducing conformation to standardization on the concession lines like the Chinese§ Eastern, South Manchuria and Tsingtao Railways, over which there is no government control, consortium pressure will be needed. This last is a big and vital question, as the Chinese Eastern has a gauge of 5-ft. and the South Manchuria a different height of coupling gear which entails transhipment and consequent congestion at junction points.

This indicates the railway and larger side of the work to be done by the consortium, and those who have the true interest of the country at heart will do all in their power to assist an organization whose success offers the only peaceful and permanent solution of the Chinese problem. The first essential to success depends on most rigid control of free-lance finance, which without morals, creed or country, is always ready for profitable fishing in troubled waters.

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# Electrical Machinery Markets in Japan

## A Promising Outlook

THE development of hydro-electric power in Japan is still in its infancy. Much has been accomplished in utilizing the natural water powers of the empire, but much more remains to be done. The business slump of 1920 brought to a sudden stop many ambitious schemes for the erection of new power plants, and further development has been checked for lack of capital. But with a return of confidence and a brighter outlook, some of the larger schemes are being revived, and we find in the island of Formosa, one of the largest hydro-electric plants in the world being financed and constructed largely by the government. The well-known American engineering firm of Stone and Webster have representatives on the ground negotiating with the Asano interests for the construction of a most important project, the details of which, as yet, have not been made public. Other large hydro-electric enterprises are waiting for the proper time to solicit new capital in order to carry out their huge plans. Amongst these is the Inawashiro Hydro-Electric Power Company, Ltd., of Tokyo, controling the water rights to a chain of lakes emptying into Lake Inawashiro and to its outlet, the Nippashi River. Seven large power houses are embraced within a comprehensive plan for the utilization of the water shed drained by the Nippashi River. Foreign manufacturers of electrical machinery and supplies should give careful study to the trend of this development in Japan, with its tendency to utilize more and more the products of home manufacture. The Japanese have made marked advances in developing their electrical industries, and despite foreign criticisms of the efficiency of their machinery, the truth stands that many important plants are now being operated with equipment made in Japan that in many respects equals the more widely known products of America, England or Germany. The day will, therefore, arrive when foreign manufacturers must face these facts and be prepared to meet Japanese competition in other parts of the Far East.

Machinery that has proved its excellence in Japan will make a strong appeal to other Asiatic people. It is for this reason that we invite special attention to the equipment of the generating plants of the important Inawashiro Hydro-Electric Power Company. The first power house, it will be noted, was equipped throughout with foreign materials; the penstocks from Thyssen & Company of Germany, the water turbines from J. M. Voith of Germany, generators and exciters from Dick, Kerr & Company (English Electric Company, Ltd.) of England, the main transformers and switchboard from the Westinghouse Electric & Manufacturing Company of Pittsburg and the traveling cranes from English makers. In the No. 2 Power House, the penstock was furnished by the Tokyo Ishikawajima Shipbuilding Co., Ltd., the water turbines by the Kobe Works of the Mitsubishi Dockyard and Engine Works, the generators exciters, switchboard and main transformers by the Shibaura Engineering Works and the overhead cranes by the Tokyo Ishikawajima Shipbuilding Works. The balance of the transmission material and station equipment seems to be about equally distributed between foreign and Japanese manufacturers. As in this instance, so in many others, Japanese-made electrical machinery is supplying the demands of the home market. The efficiency and general finish of the products will increase until they will make a strong bid for the export trade. In some cases, Japanese manufacturers are working under expert foreign supervision and control the patents for Japan of many of large foreign electrical manufacturers. The Shibaura Engineering Works turns out General Electric equipment; a new German-Japanese company, combining the Siemens and the Furukawa interests has been organized to manufacture electrical machinery in Japan under German expert supervision, and it is now reported that the American Westinghouse Company has combined with Japanese capital for the erection of a similar works in Japan.

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†200 30-ton cars at $3 per car per day for 15 years.

‡C.E.R. now a Russo-Chinese Railway.

§The Chengtai Railway which is a metre gauge line—a grave economic mistake for which French engineers are responsible.

With the great Kawasaki, Mitsubishi, Kuhara, Mitsui, Furukawa, Takata and Okura interests actively engaged in manufacturing or developing electrical machinery and devices, to say nothing of the many secondary companies, turning out material of the highest order, an intense competition must inevitably arise for the supply of domestic requirements, and with the immense resources at the command of these princely houses, it is to be expected that they will reach out for their share of other markets.

Like Sweden, Japan in time will extend her net-work of electrical power services to cover most of the requirements of her population, creating a home market of such huge dimensions that will enable her to manufacture electrical equipment at costs that must prove a serious concern to others. It is evident that Japanese capitalists are looking ahead to this development, and this possibility explains to a large extent, the desire and readiness of foreign manufacturers to co-operate with them in the establishment of large manufacturing plants.

Aside altogether from the industrial possibilities of electric power development in Japan, the growing requirements of the government railways and tramways will absorb most of the power that can be generated. Huge plans have been drafted for the application of electric power to the railway system of Japan, and as new water powers are harnessed, they will be taxed to meet the demands of industry and local transportation. There are at present over 300 minor steam railways and tramways operating in Japan that will be transformed into electric lines as power is developed.

The Japanese are rapidly organizing their electrical machinery industries to take care of thisg reat domestic demand. Nothing is too big for the manufacturer to undertake, and we find many large generating plants entirely equipped with home-made machinery operating beside others equipped with the best products of foreign factories. Efforts are being concentrated on betterments in workmanship, finish and efficiency, and under the guidance of foreign experts and the stimulus of competition a great improvement may be looked for. It is true perhaps, that during the period of the war, many Japanese manufacturers made the same mistake as manufacturers of other nations, and in the rush to obtain markets and turn out the materials quickly, much inferior rubbish was exported. However, the Japanese manufacturer was not alone in this practice, and now that he has to face the realities of normalcy and the competition of the older established foreign manufacturers, he recognizes that only the best product will win. Their products are improving and much solid progress has been made, especially in the initial work of improving their plants, bringing them up to date with the addition of the best types of machinery. Japan's present problem is the lowering of costs of production, and a general readjustment of wages and living conditions in order to permit its products to successfully compete with other nations. As things stand at the present moment, with the balance of trade heavily against them, the Japanese manufacturer must first face the problem of reducing costs in order to hold his own market. Under the careful and wise guidance of the governor of the Bank of Japan and other high authorities, much progress is being made towards this end, but there is still much to do before prices can be brought down to a level where home products can successfully hold the home market against the flood of competition from better organized and equipped foreign manufacturers. However, it may be accepted that the present situation is only a temporary one, and as the electrical machinery plants are re-equipped with the latest machinery, the expansion of their home market will enable them to reach a basis of quantity production that must materially lower costs and permit them to compete more successfully for the export trade.

Amongst the more important manufacturers of electric equipment in Japan are the following concerns :—

| | Established | No. of Workmen | Capital 000's Yen |
|---|---|---|---|
| Shibaura Works, Tokyo .. | June 1894 | 2,787 | 5,000 |
| Hidachi do. .. .. | July 1911 | 1,481 | |
| Okumura do. .. .. | Jan. 1895 | 818 | 10,000 |
| Mitsubishi Shipyard Electrical Dept. .. .. .. | Nov. 1919 | 1,652 | |
| Kawakita Works .. .. | Apl. 1913 | 750 | 6,000 |
| Osaka Electric Light Co. Elec. Machine Dept. .. .. | Oct. 1897 | 597 | |
| Osaka Elec. Machine Mfg. Co. | Dec. 1911 | 253 | 5,000 |
| Yasukawa Works .. .. | Jan. 1917 | 410 | 250 |

Manufacture of telephones and telegraphic machinery and electric lamps :

| | | | |
|---|---|---|---|
| Japan Electric Co. .. .. | July 1889 | 743 | 5,000 |
| Oki do. .. .. .. | Aug. 1911 | 613 | 2,500 |
| Tokyo do. .. .. .. | Feb. 1912 | 2,720 | 6,000 |
| Osaka Electric Co. Lamp .. | Feb. 1907 | 448 | 1,000 |

There are many other smaller manufacturers of lamps and accessories, whose products found only on the home market, cut no figure in the export trade, and who, in the fierce competition with the larger firms are destined to be absorbed. The existing companies have already developed a considerable market for their products in other Asiatic countries especially in China and India. Manchuria and Eastern Siberia are to a large extent part of the home market, but the Japanese have to fight hard to obtain the more important orders not controlled by their own nationals. According to figures recently compiled by the department of agriculture and commerce of Japan, the export of electrical machinery of all kinds in 1914-15 was valued at only Y. 500,000. This was doubled in 1916. In this period, the export of telephone apparatus has increased in value from the negligible sum of Y.16,000, to almost a million, although succeeding years record a falling off.

The following table shows the increase in exports, China and India being the chief buyers (in 1920 for ten months only) :—

| Year. | General Electric Machines and Parts Thereof. | Telephone Apparatus and Parts Thereof. |
|---|---|---|
| | Yen. | Yen. |
| 1914 .. .. | 450,127 | 16,320 |
| 1915 .. .. | 582,075 | 48,784 |
| 1916 .. .. | 1,446,923 | 896,143 |
| 1917 .. .. | 2,493,000 | 429,000 |
| 1918 .. .. | 3,984,000 | 420,000 |
| 1919 .. .. | 4,443,000 | 630,000 |
| 1920 to Oct. .. | 3,983,141 | 597,380 |

Import generally fell off in 1915, but began to revive in 1917, lasting until 1920. There was a large increase in 1919 and 1920, in such goods as motors, transformers and dynamos. The following table gives the value of the import trade (in 1920 for ten months only) :—

(Values in Yen)

| Year. | Dynamos & Motors. | Dynamos coupled with Motor Machinery. | Telegraphic and Telephone Apparatus and parts thereof. |
|---|---|---|---|
| 1914 .. | .. 2,407,634 | 435,470 | 716,168 |
| 1915 .. | .. 501,406 | 248,129 | 49,171 |
| 1916 .. | .. 391,958 | 441,897 | 59,860 |
| 1917 .. | .. 1,129,000 | 583,000 | 61,000 |
| 1918 .. | .. 3,061,000 | 485,000 | 91,000 |
| 1919 .. | .. 5,245,000 | 736,000 | 265,000 |
| 1920 .. | .. 4,558,975 | 588,488 | 530,529 |

An analysis of this trade shows the distribution of the imports between 1914 and 1919 (000's omitted) :—

| | | | |
|---|---|---|---|
| | 1914. | 1915. | 1916. |
| Dynamos and Motors : | | | |
| America.. .. .. | 1,069,312 | 327,170 | 219,836 |
| | 1917. | 1918. | 1919. |
| | 1,076 | 2,975 | 4,763 |
| | 1914. | 1915. | 1916. |
| England.. .. .. | 401,050 | 130,574 | 95,483 |
| | 1917. | 1918. | 1919. |
| | 49 | 36 | 187 |
| | 1914. | 1915. | 1916. |
| Germany .. .. | 786,988 | 22,377 | 17,533 |
| | 1917. | 1918. | 1919. |
| | 0 | 1 | 0 |
| Dynamos Coupled with Motive Machinery : | | | |
| | 1914. | 1915. | 1916. |
| America.. .. .. | 14,321 | 62,921 | 247,320 |
| | 1917. | 1918. | 1919. |
| | 490,000 | 483,000 | 431,700 |
| | 1914. | 1915. | 1916. |
| England .. .. | 265,575 | 186,208 | 145,649 |
| | 1917. | 1918. | 1919. |
| | 43,000 | 0 | 0 |
| | 1914. | 1915. | 1916. |
| Sweden .. .. .. | 0 | 0 | 0 |
| | 1917. | 1918. | 1919. |
| | 49,000 | 0 | 199,000 |
| Telegraphic and Telephone Apparatus : | | | |
| | 1914. | 1915. | 1916. |
| America.. .. .. | 20,386 | 14,327 | 26,598 |
| | 1917. | 1918. | 1919. |
| | 50,000 | 74,000 | 247,000 |
| | 1914. | 1915. | 1916. |
| England .. .. | 40,463 | 28,636 | 28,559 |
| | 1917. | 1918. | 1919. |
| | 6,000 | 1,000 | 5,000 |

* * *

# Who's Crazy Now?

SOME time in 1913, Dr. Sun Yat-sen made public his ideas on issuing paper currency based on the value of merchandise and the necessities of life stored in government warehouses. His friends and enemies alike immediately said he was crazy and whilom advisers seized this opportunity to justify their betrayal of his cause and solidify themselves with the Peking mandarinate. Since then, whenever the occasion arises, these defamers of Dr. Sun, invariably refer to his currency plan as proof positive of an unsound mind.

Well! there appears to be others. No less a lunatic than Thomas A. Edison has sent out a questionnaire to bankers and economists for opinions on a variety of subjects, the most important of which was whether national resources were not a good basis for federal currency. His first question was: " What, in your opinion, would be the approximate market value of a Troy ounce of pure gold if all the governments in the world should demonitize it." He also sought information as to why currency on a basis of fifty per cent. of the value of necessities of life stored in government warehouses would not be sound money, and why the equity retained in the warehouses should not be discounted at commercial banks. If such issues of money are unsound, the inventor asks that the bankers enlighten him why. Phew! Sun Yat-sen all over again. The old inventor who thinks with his head instead of with his feet, has the nerve to put it up to the economists and bankers and requests them to answer.

According to the " Christian Science Monitor " " this perfectly simple inquiry seems to arouse the editorial minds of certain papers to a fine frenzy. Instead of answering the question with facts they resort to abuse. They even refuse to discuss it, expressing wonder that the money question queers the soundest practical minds from Benjamin Franklin to Peter Cooper and from Cooper to Edison and Henry Ford." They apparently overlooked Dr. Sun Yat-sen who seems to be in very good company; in fact, the company of the most practical men the world has produced.

It will be interesting to read the answers of the leading bankers and economists to Mr. Edison's questions. Coming from him it would seem that such questions are eminently pertinent and should be treated with respect.

# Japanese Patent Law

Changes have recently been made in the patent law of Japan which will probably improve the value of Japanese patents and facilitate the obtaining of effective grants. Although Japan has been a favorite country with patentees, yet for a number of years the procedure and results have appeared in the eyes of many to have been very unsatisfactory. Applications have been rejected on grounds which did not appear adequate or the patents allowed did not seem to cover all that the inventor felt that he was entitled to protect.

The new laws were put into force at the beginning of this year, but it is desirable for those having applications at present on file to be aware of the fact that it is generally understood that the new procedure under the recent law will not apply to them. Japan being a party to the international convention, one year is permitted from the date of filling a foreign specification to enable an application to be lodged in Japan. It seems that a patent is to be granted for any given invention to whoever applies first independently of any alleged priority, say of manufacture. The foreign inventor should therefore definitely file his application under the provisions of the international convention, claiming his foreign date which will be effective, and not risk relying on the Japanese date.

Apparently, a single patent under certain circumstances may cover both process and apparatus, but substances made by chemical processes are not patentable. The examiner will make a search as heretofore, but provisions are made for dealing with the examiner's objections, and it is thought that the new arrangements will result in less delay than has been heretofore experienced in the prosecution of Japanese applications. The examiner will not be empowered to reject a case definitely until the applicant has been able to deal with his criticisms. An opposition period after publication of the specification is now to be allowed on the lines of British practice, namely, within two months of the date of publication in the official gazette, and it appears that the examiner shall decide finally on the matter not only on the grounds found in his investigation, but by the result of his study of the opposition.

Re-examination of the application of rejection by the examiner is modified in the new law, and apparently a kind of hearing or trial is substituted with the rejecting examiner a defending party. The case is at this stage considered by a group of several examiners, and it is thought by those in Japan that this course will give much better protection to the inventor than the former system. Among the other provisions there may be noted that working requirements are still made, and there are sections dealing with the grant of compulsory licences. The Japanese patent term is fifteen years dating from the date of publication, and all patented articles must be marked, or no damages can be claimed for infringement.

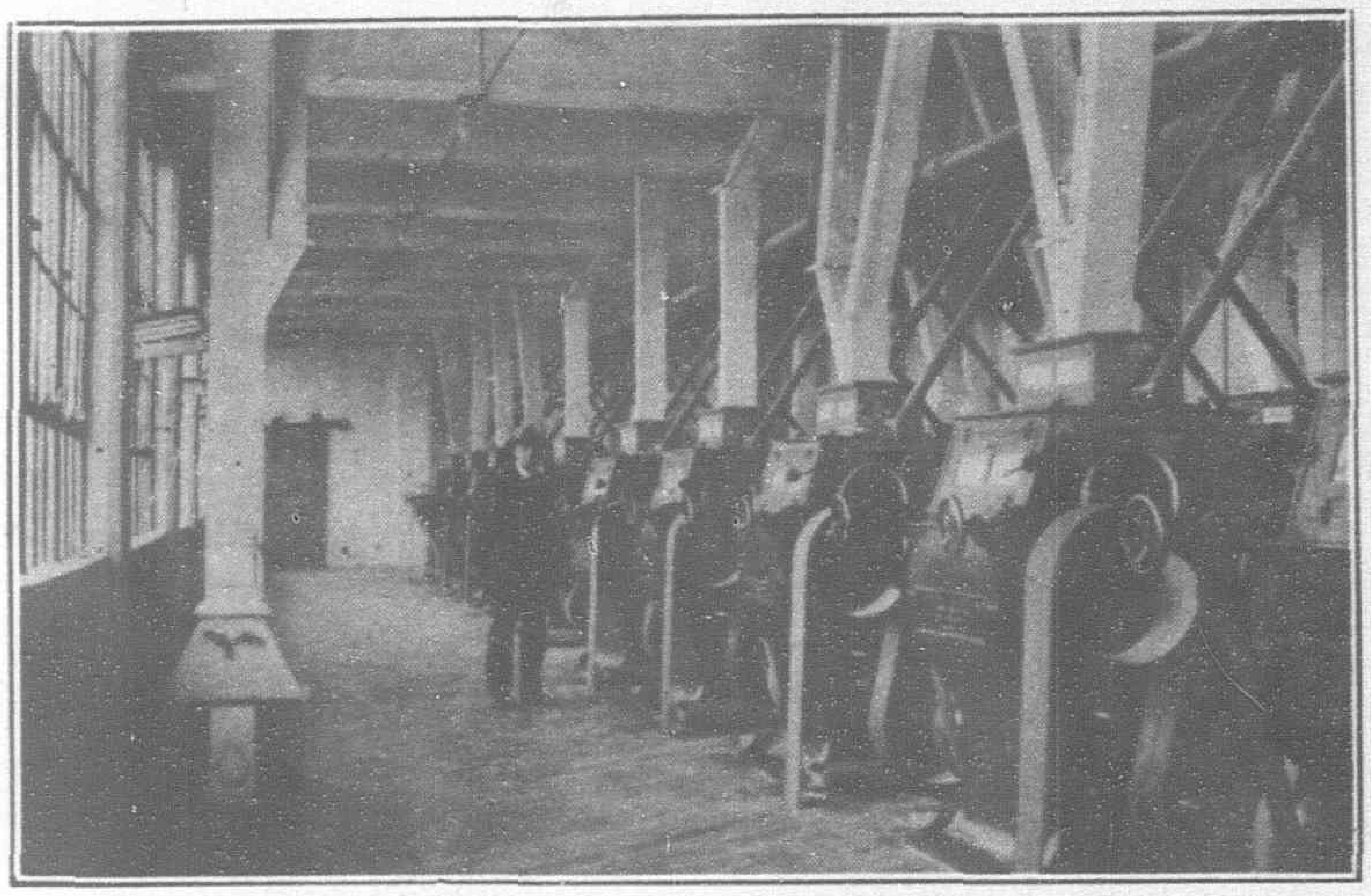
# A Three Thousand Barrel Allis-Chalmers Flour Mill in Shanghai

## Progressive Chinese Milling Firm Completes a New Plant, The Fourteenth in its Chain of Mills

*Editorial Note.*—Newspapers in the United States are commenting on the fact that for the first time in history, flour milled in China is being sold in the markets of Europe. Heretofore, the Chinese have been great buyers of American flour, but recently conditions have changed and the Chinese mills are exporting it in large quantities. There are great stretches of land in China suitable for raising wheat, with labor at a very low level. The following article from the *American Miller* on the great Fou Sing flour milling enterprises in China indicates the great advances that have been made by one company in developing its business until now it has a large export trade reaching to Australia and Europe, where its products compete successfully on their merits with the more widely known American, Canadian and Japanese brands.

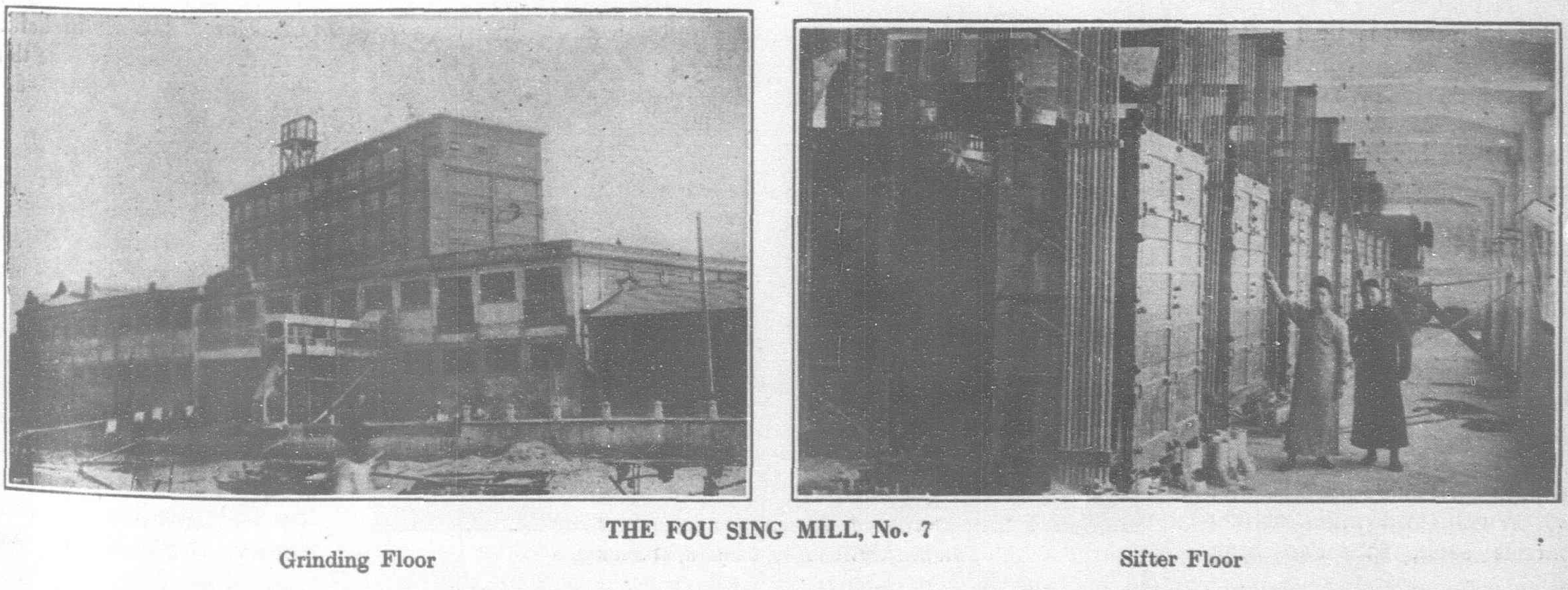
THE opinion prevails in America that milling is a comparatively new industry in China dating from the introduction of English and American machinery and milling plants in that country. Nothing could be farther from the truth, for Chinese milling is a very old art, and the milling craft ranks high among Chinese castes. To be sure, the Chinese never have been great bread eaters, but the alimentary pastes, such as noodles and macaroni were principal articles of diet long before Columbus set out for America from Spain.

We think of the Chinese as a rice-eating people, and it is true that rice is the chief cereal food of three-fourths of the people. The southern part of China is warm and with abundant rainfall, the soil is rich, and the farmers have handed down their knowledge of agriculture from generation to generation for hundreds, even thousands, of years. They do not know much about scientific agriculture—as a science, but they have found out by experience and practice as a regular thing many of the principles which we regard as new science. Among these practices are crop rotation, fertilization, the use of legumes for supplying nitrogen to the soil, summer fallow, etc. Practically every vegetable, grain and fruit which we are familar with in America is grown in China, and many others besides. In southern China from two to six crops are raised from the same land each year. Most of the farmers are tenants and pay their rent with a large share of their rice crop, but many farmers own their land and are prosperous.



The Fou Sing Mill, No. 7, at Shanghai, installed and equipped throughout with Allis-Chalmers Flour Mill Machinery, sold through the American Trading Co.

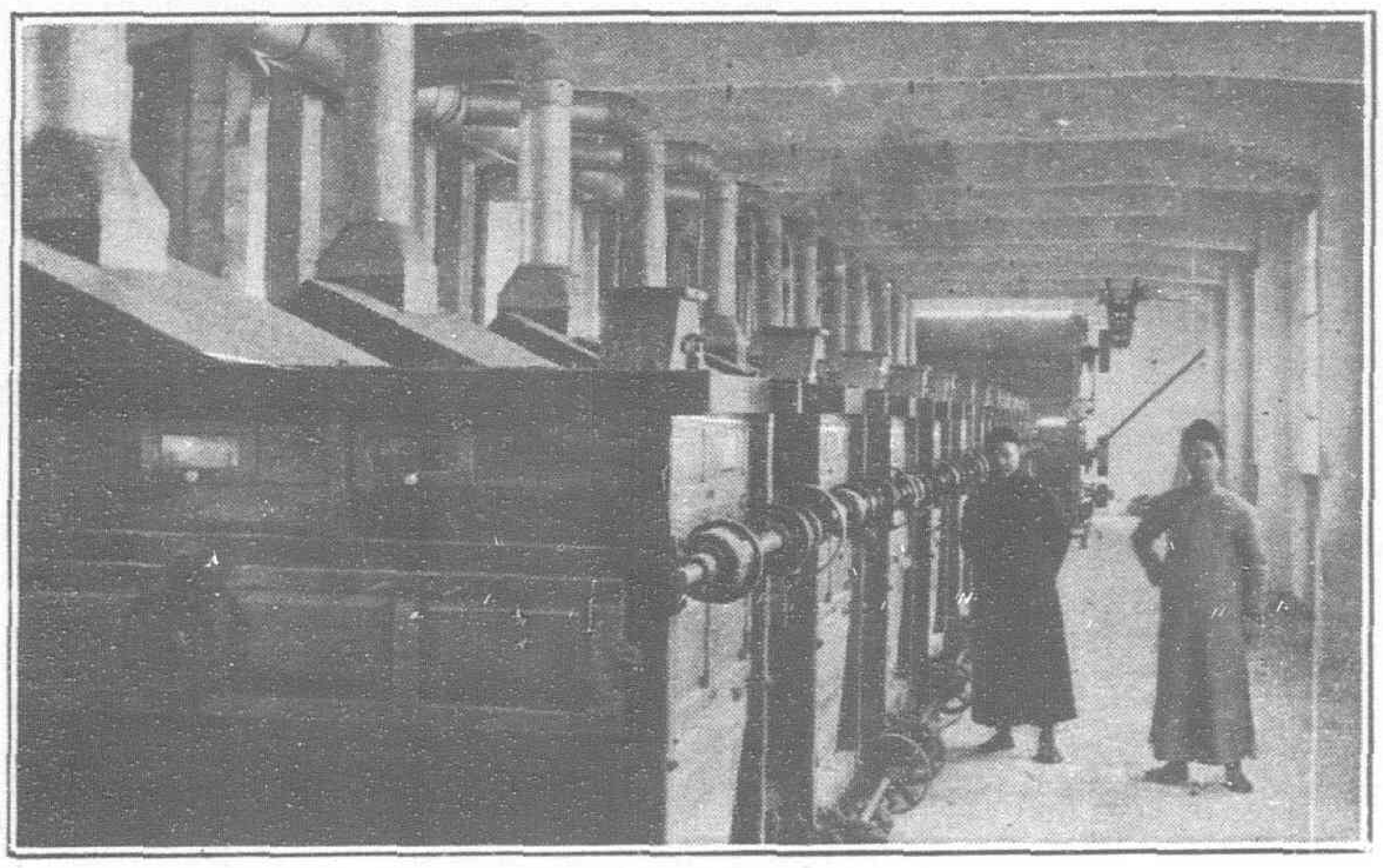
But it must be remembered that China, including Manchuria and Thibet, is considerably larger than the United States, being 2,400 miles from north to south and about 3,000 miles broad. Its climate shows even greater variety than ours for the extremes of temperature between summer and winter are more marked. In the central and northern portions conditions closely resemble our grain belt. The soil is largely alluvial, the great rivers bringing down vast quantities of fertile soil each year, much of it being the fine dust which blows for hundreds of miles from the Gobi Desert. Wheat is raised in great quantities and in marked varieties. For instance, Manchuria grows a macaroni wheat of great strength but of poor color for flour; Northern China, or the provinces of Shantung, Szechuan and Honan, grows a white wheat similar to



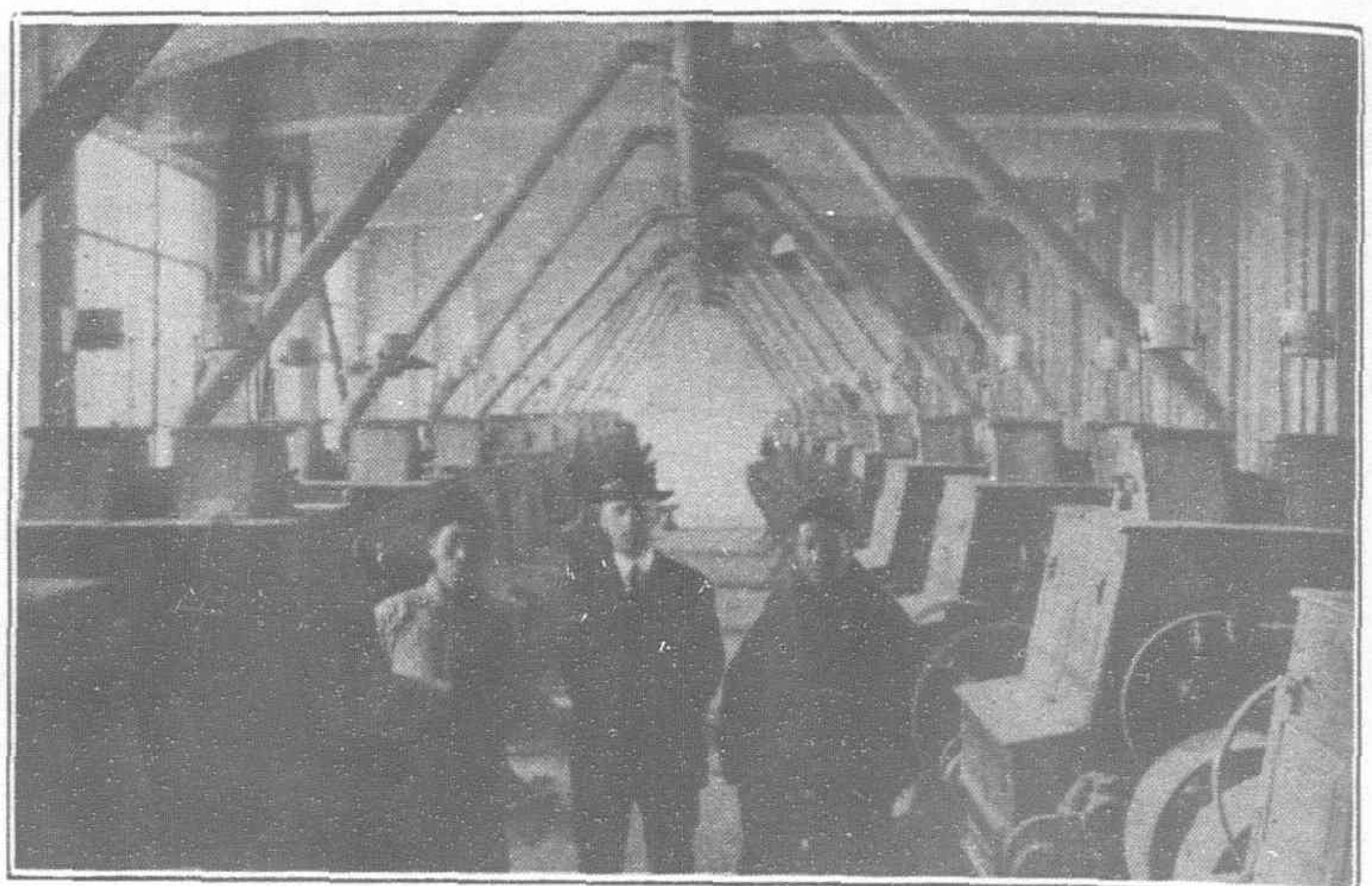
THE FOU SING MILL, No. 7

Grinding Floor

Sifter Floor



Purifier Floor, Fou Sing Mill



Roller Mills Floor, Fou Sing Mill, No. 8

the Walla Walla, but softer, which is good in strength and excellent color, light in bran and clean and free from impurities. In the central province of Hunan is grown a large red winter wheat called "Hankow" of good strength and fair color, but heavy in bran. In the Yangtze Valley in the provinces of Chinkiang and Kiangse a variety is grown which is called Wusih wheat. It has a small light red berry, fair strength, good color, light bran, and is regarded as the best all-round wheat in China. Wah-Yo wheat is grown in Anhwei province. It is a transparent wheat sprinkled with white berries, very strong in gluten, fair color, fairly clean and light in bran. South of Shanghai there is grown a soft red wheat of good color but very low in gluten.

In the March issue of the *American Miller*, Mr. Sanborn states that Chinese wheat contains gravel or stone, giving the impression that all Chinese wheat comes to mill in that condition. Mr. Akerman, milling superintendent for the Foh Sing Mill at Shanghai, write that this impression is erroneous, for a certain variety of Hankow wheat only, contains stone and has to be specially washed on this account, all other Chinese wheats being quite free from stone of any kind. Mr. Akerman also states that wheat is plentiful and has improved wonderfully in recent years, and that China will soon have to be reckoned with as a flour exporting country.

Now, Mr. Akerman ought to know, for he not only is of milling stock, his father and grandfather being millers, but he went to China in 1899 as assistant miller in the first modern flour mill built in Shanghai. He installed several mills in China and ran them for over 14 years. Then, in 1917, he joined the British army and served in France for two years, rising to the rank of captain. While still in France, Mr. Akerman's services were secured by the Mow Sing & Foh Sing Flour Mills to serve as superintendent of mills Nos. 1, 3, 6 and 7 at Shanghai, The Foh Sing Mill No. 7, which has been completed being the largest mill in China at the present time.

The Mow Sing & Foh Sing Mills Company is by far the largest milling concern in China. They have 14 mills, of which, three are leased. Seven of the mills are at Shanghai. No. 1 is of 400 barrels' capacity; No. 2, 3,000 barrels; No. 3, 1,200 barrels; No. 4, 1,200; No. 5 (now known as No. 8), 1,500 barrels with machinery ordered to double the capacity; No. 6, 1,200 barrels; No. 7, 3,000; and the Yuen Fong Mill (leased) 300 barrels. At Hankow a 1,500-barrel mill; at Wusih two mills of 500 barrels each, the Pao Sing Mill (leased) 400 barrels, and the Tar Loung Mill (leased) 300 barrels; and at Tsinanfu, one mill of 600 barrels. This makes a total capacity of 15,600 barrels of flour per day. And this, remember, is China, the rice-eating country.

The company was founded and is now managed by T. K. Yung, who is known as the Flour King of China, and one of the most highly respected and progressive business men of that country. W. C. Wong is manager of Foh Sing Nos. 1, 3, 6 and 7 mills. He is a keen business man, alert and progressive and deserved much of the credit for the successful development of the mills under his care. He works in close harmony with Mr. Akerman and together they make a strong combination.

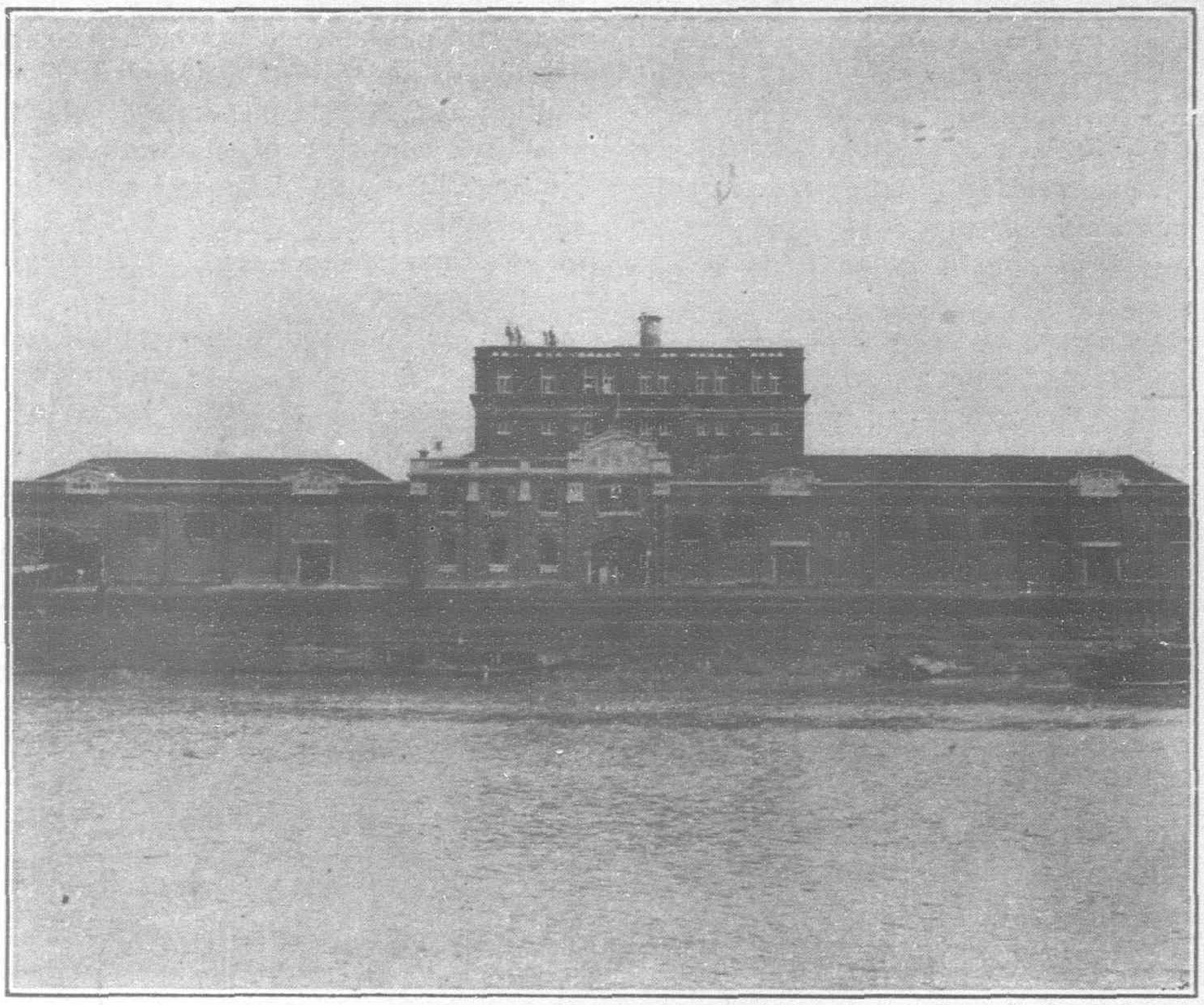
The Foh Sing Mill No. 7 was designed by the Allis-Chalmers Manufacturing Company and the complete equipment was furnished by that firm through its agents, the American Trading Company of Shanghai, China. The mill was built, however, by Chinese contractors and the machinery was installed by native millwrights under the supervision of Mr. Akerman.

The plant is eight stories high and is of reinforced concrete construction with wooden floors. The general layout of the plant includes elevator heads, 22 universal dividers for dividing stock to the sifters, and 12 perfection dust collectors, taking care of the dust from all purifers and elevator suction trunks on the eighth floor. On the seventh floor are 16 No. 1070A Allis sifters, with eight centrifugal reels and nine purifiers. The sixth floor has nine purifiers, eight centrifugal reels, six rebolting reels, four bran dusters, and four short dusters.

The fifth floor is a maze of spouting with little else except fans and dust collectors for the roll suction. On the fourth floor are 22 double stands of 9 by 36 rolls and 27 double stands of 9 by 300 rolls, all of the style A, Allis types. Fifteen stands are used on breaks and 34 stands on reductions. The main shafting and drivers are on the third floor together with flour packer bins.

The second floor is of reinforced concrete, the only floor of this kind in the mill. There are 12 reliance flour packers, elevator boots and an 18-inch belt conveyor running the whole length of the packer row and extending into the warehouse for conveying flour from the packer floor. A portion of this floor is partitioned off and contains roll corrugating and grinding machinery, so that the rolls can be kept

Fou Sing Mills, Nos. 2 and 8, at Shanghai in perfect condition at all times without taking them outside the building. This provision, of course, is not necessary in American mills for here are plenty of well-equipped roll-grinding and corrugating plants convenient to all mills, but in China machine shops are not available everywhere and transportation is so poor that costly delays might be encountered. The first or ground floor of the mill has three reliance bran packers, storage bins for bran made during the night shift and the wood and tin shops. According to Mr. Akerman, Chinese mills either work full time or shut down entirely, and "when working would work Sundays, high-days, holidays and every other kind of days if the miller would stand for it." So there is need for these bran bins so that all bran can be packed in daylight.

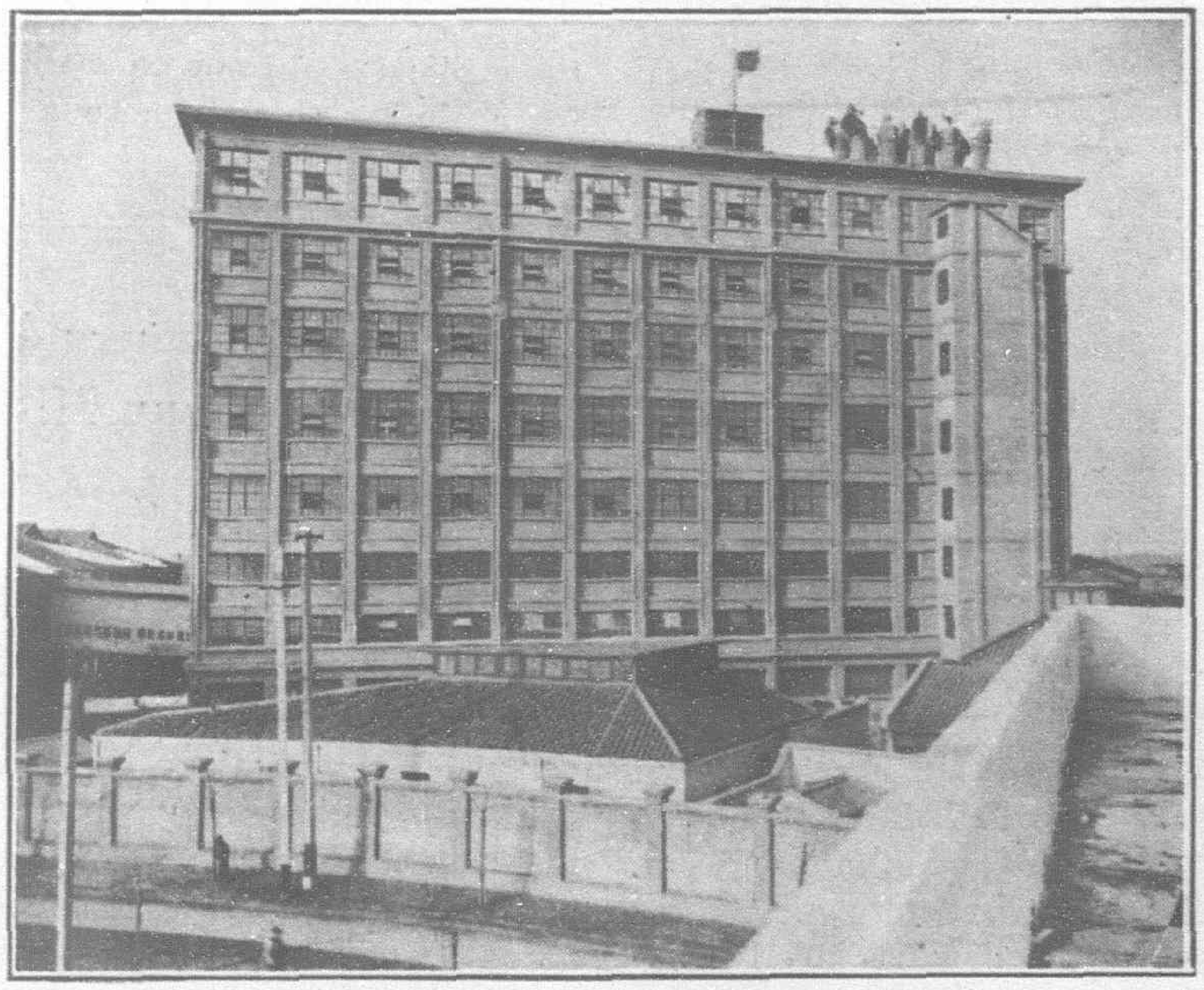


The Fou Sing Mill at Hankow

The cleaning department of the mill is in a separate part of the building and is included on all eight floors. On the eighth floor of this department are cyclone dust collectors, dust room, elevator heads and dampening conveyor. The seventh floor has a large double receiving separator, which, with the elevator, is driven with a separate 50 horse-power motor; two first milling separators; two rolling screens; and two iron prince scourers.

On the sixth floor are two large eureka scourers and a second milling separator. Four eureka cockle machines, each of six cylinders, and one second milling separator are on the fifth floor. The fourth floor has three iron prince scourers and four eureka brush machines.

The third floor is taken up with shafting, elevator boots, etc., and the second floor with bagging off spouts. On the ground floor are the conveyors from bins, elevator boots, and the main shaft drive and belts in a closed off room. As will be noted from the cleaning flow, reproduced above, the cleaning process is remarkable for its thoroughness.



Another Fou Sing Mill at Shanghai

The mill is driven entirely by electricity. The motor room is built on the end of the cleaning department and is of reinforced concrete construction. It is equipped with one 1,200 horse-power Allis motor, transmitting power to an 8½-inch shaft carrying two 60-inch belts which comprise the main drives of the mill.

The mill is completely equipped with a sprinkler system, supplied from a 9,000-gallon tank built on the roof, and also connected with a 750-gallon per minute underwriters pump, driven by a 75 horse-power-motor. There is also a 35-gallon supply pump with an air compressor attached for supplying air pressure to the sprinkler system.

In the warehouse a preliminary wheat cleaning plant is being installed with an 80-inch belt conveyor for carrying wheat to the cleaning department. A complete system of portable conveyors and stackers is also being installed for receiving wheat and discharging products into boots. At present this is all done by coolie labor, the men carrying four bags of flour or two bags of bran which weigh two piculs, or 266⅔ pounds. This labor is all piece work and the coolies sometimes earn as much as $1 (Mex.) per day, equal to 50 cents in gold. This is a very good wage for this class of labor in China, but it remains to be seen if the mechanical conveyors can do the work more economically.

The mill storage consists of three brick warehouses for the storage of wheat in bags with a combined capacity of about 300,000 bushels, and two reinforced concrete warehouses for the storage of flour with a capacity of 500,000 bags. In the mill itself, the milling bins have a capacity of 40,000 bushels and the tempering bins will hold 5,000 bushels.

The plant was started up in October of last year and has been running day and night ever since, and has given perfect satisfaction in its results. The average day's run for the mill is 12,000 50-pound sacks of the different grades divided as follows: 5 per cent. patent: 70 per cent. bakers; 18 per cent. clear low grade; and 7 per cent. red dog. The patents are sometimes turned into bakers and a straight grade made. A recent analysis of the straight flour showed: Moisture, 12.01; ash, .485; gluten, 9.72. Color and elasticity of gluten, good; color of flour, good.

The distribution of the flour is interesting. The patents go to local foreign bakers to supply the need of the foreign population at Shanghai. The straights and bakers go to export, and the low grade and red dog to Chinese consumers.

Chinese mills have done a large export business recently for the wheat control measures in Australia have put the Austr-

(*Continued on next page.*)

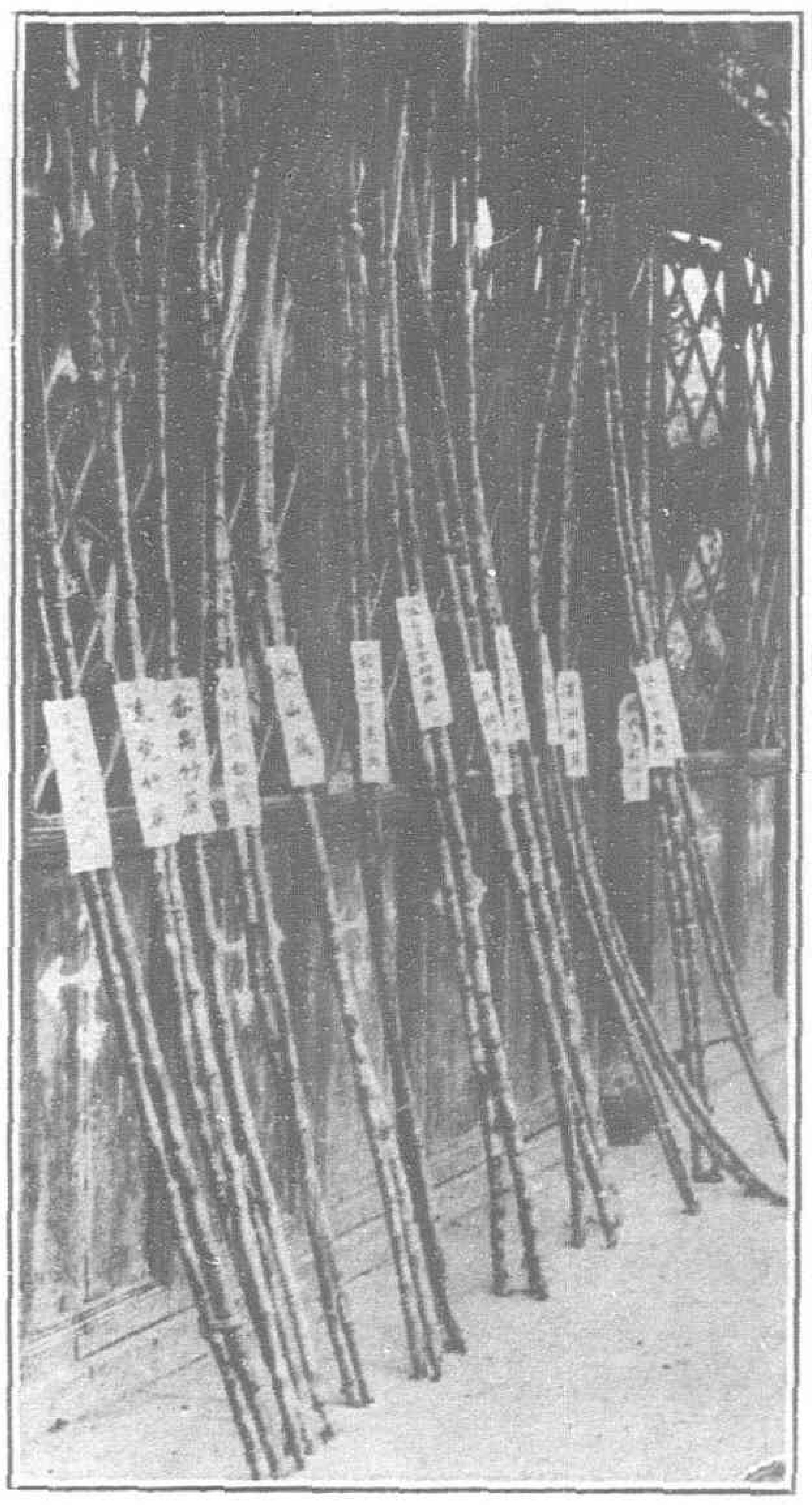
# The Second Kwangtung Agricultural Exhibit

## Openings for Farming Implements

*By C. O. Levine*

THE second agricultural exhibit of Kwangtung province was held on March 1st to the 10th at the provincial agricultural and forestry experiment station, Canton, China. With the united efforts of the government agricultural station, the College of Agriculture of Canton Christian College, and the progressive governor of the province and his officials, an exhibit of agricultural products was prepared that was a credit to the province, in spite of the fact that the seamen's strike prevented a great deal of material for exhibiton purposes from coming in from the various districts of the delta region.

The exhibit was originally planned for seven days. However, because of the interest shown and its evident educational value, it was extended to ten days. Each day some 15,000 people came to view the exhibits and demonstrations.



Varieties of Sugar Cane, grown in Kwangtung Province

The expense of the exhibit was met by government appropriation. The admission was free, so that it was possible for every farmer in the vicinity of Canton to get the benefit of the exhibit. Although it was held at a busy season of the year it was pleasing to note that a large part the attendance was composed of farmers from surrounding villages.

Among the many exhibits those of sericulture, entomology, forestry, cotton, vegetables, citrus fruits, canning, farm machinery, swine, dairy and poultry were of special interest. In the dairy, poultry and swine exhibits were representatives of the shipment of animals from America just received at Canton Christian College. This shipment included Holstein Fresian cattle, Toggenburg milch goats, Berkshire pigs, Barred Plymouth Rock and White Leghorn chickens. All of this stock is of unusually fine breeding, and the animals shown were a valuable addition to the exhibit.

A Babcock demonstration was made every afternoon to show how buffalo milk compares in fat with European cow's milk. Buffalo cows, which are by far the most common cattle in Kwangtung, give very little milk, but the milk is very rich and nourishing. It contains three and one-half times as much fat as European cow's milk, or about 11.25 per cent. Hence, it especially valuable for cream or butter. It is very palatable although some find it too rich because of its high fat content.

One point in favor of buffalo milk is the fact that buffalos are free from tuberculosis, that dreaded disease common in European dairy cows as well as in the human family. No case of tuberculosis in buffalo cows anywhere in the world has ever been known.

The machinery exhibit, mostly Chinese, American and Japanese, was of unusual interest, and drew a large crowd of interested folks at all hours of the day. The machinery from abroad included plows, harrows, hand seeders, cream separator, churn, cotton gin, pumps and spraying outfits. The large American grain drills, steam plows, and threshers are at present far beyond the farming conditions of most parts of China, but the modern wheel hoe and planter or one-horse (one-cow) machinery will before long be in demand by the more progressive farmers of this and other provinces. In small, simple and inexpensive modern machinery they have part of the solution of the problem of meeting the slow but steady rise in cost of labor.

A part of the sericulture exhibit was a demonstration prepared by the government agricultural experiment station showing improved methods of unwinding cocoons and reeling silk. This exhibit also contained a demonstration showing methods of controlling and eliminating disease, which frequently cause as much as 90 per cent. loss of silk worms. The College of Agriculture of Canton Christian College is leading in silk worm disease control and is selling eggs to villagers in which the disease has been reduced to less than one per cent. of the eggs. Since silk is by far the greatest export product of Southern China, this work of introducing modern methods and disease control is of extreme importance.

The exhibit of fruits and vegetables was unusually large, and showed that the Cantonese are not content with their own scores of varieties of valuable fruits, but are going to America and other countries for horticulture specimens which will add to the large varieties already represented in that locality. Some of the recent introductions are: cauliflower, tomatoes, head lettuce, lima beans, sweet corn; and among fruit trees, the American peach, plum, grape fruit, oranges and other pome and citrus fruits. The horticulture and agronomy section of the exhibit included more than two thousand different entries.

During the exhibit, a test was conducted by the experiment station showing the percentage of sugar in different varieties of locally grown sugar cane. A native press, with decided improvements, was used for this purpose.

The exhibit included material sent in from forty different districts of the provinces, thirty schools, as well as many entries by individuals and business firms.

The Kwangtung agricultural exhibit was initiated in 1916 by Mr. Chu Ching-lan, then the civil governor of the province. It was originally planned to make the exhibit an annual event, but due to political disturbances these plans could not be carried out. Plans are now being made for a similar though more extensive Exhibit in 1922.

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# A Three Thousand Barrel Allis-Chalmers Flour Mill in Shanghai

(*Continued from page 305*)

alian mills out of the competition, and as a consequence, China has had less competition than formerly. Japanese, Canadian and American flour are all competitors, however. But this new Foh Sing Mill can meet any of them on an even basis for the equipment and operation of the mill are of the most modern types and economies are looked after as carefully as in the best regulated American plants. The Chinese milling company is certainly to be congratulated on its mill and the progressive policy it has assumed, and can look forward to a most successful career.

# Egg Products in China

A JAPANESE official estimate in 1919 places the total number of hens in Shantung at 1,500,000 and estimates the annual production of eggs in that province at 126,000,000, or 84 eggs per hen. The exports of eggs originating in the province, including fresh, preserved and manufactured eggs, totaled 91,684,611 in 1913, a normal year. On this basis of 73 per cent. of production exported, the production for all China in 1917 was estimated as follows:

| | |
|---|---|
| Exports of yolk (29 per cent. of the total weight of egg albumen and yolk exported in 1917, 53,502,500 pounds), 15,515,725 pounds, equivalent on the basis of 50 eggs to the pound of yolk to .. .. .. .. .. .. | 775,786,250 |
| Total exports of frozen eggs (4,756,100 pounds) and estimated weight of shell (475,610 pounds), 5,231,710 pounds, equivalent on the basis of 10 eggs to the pound to .. .. .. .. | 52,317,000 |
| Total number of whole eggs, fresh and preserved, exported .. .. .. .. .. .. | 247,400,000 |
| Total exports .. .. .. | 1,075,503,350 |
| Total annual production .. .. | 1,473,292,250 |

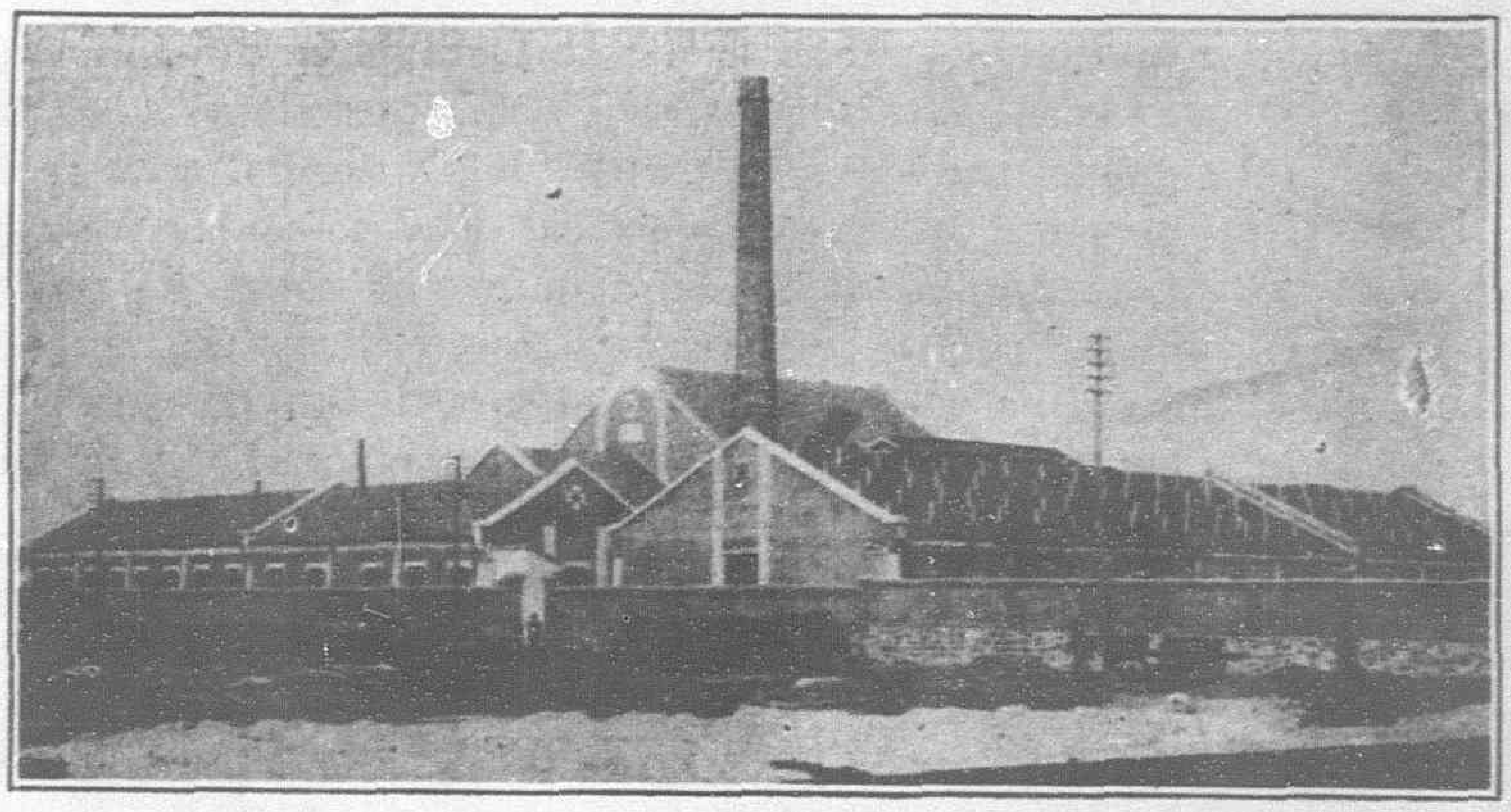
Customs figures, says a recent bulletin of the bureau of economic information, prove the industry to be of considerable importance in China's trade to-day. The following export figures give an idea of the progress registered since 1912:—

| *Date* | *Piculs* | *Haikwan Taels* |
|---|---|---|
| 1912 | 125,167 | 1,984,578 |
| 1913 | 155,973 | 2,943,956 |
| 1914 | 132,158 | 2,870,087 |
| 1915 | 199,967 | 4,864,925 |
| 1916 | 288,346 | 7,702,403 |
| 1917 | 495,019 | 11,999,684 |
| 1918 | 289,357 | 9,307,227 |
| 1919 | 606,182 | 19,825,098 |
| 1920 | 423,203 | 11,928,143 |

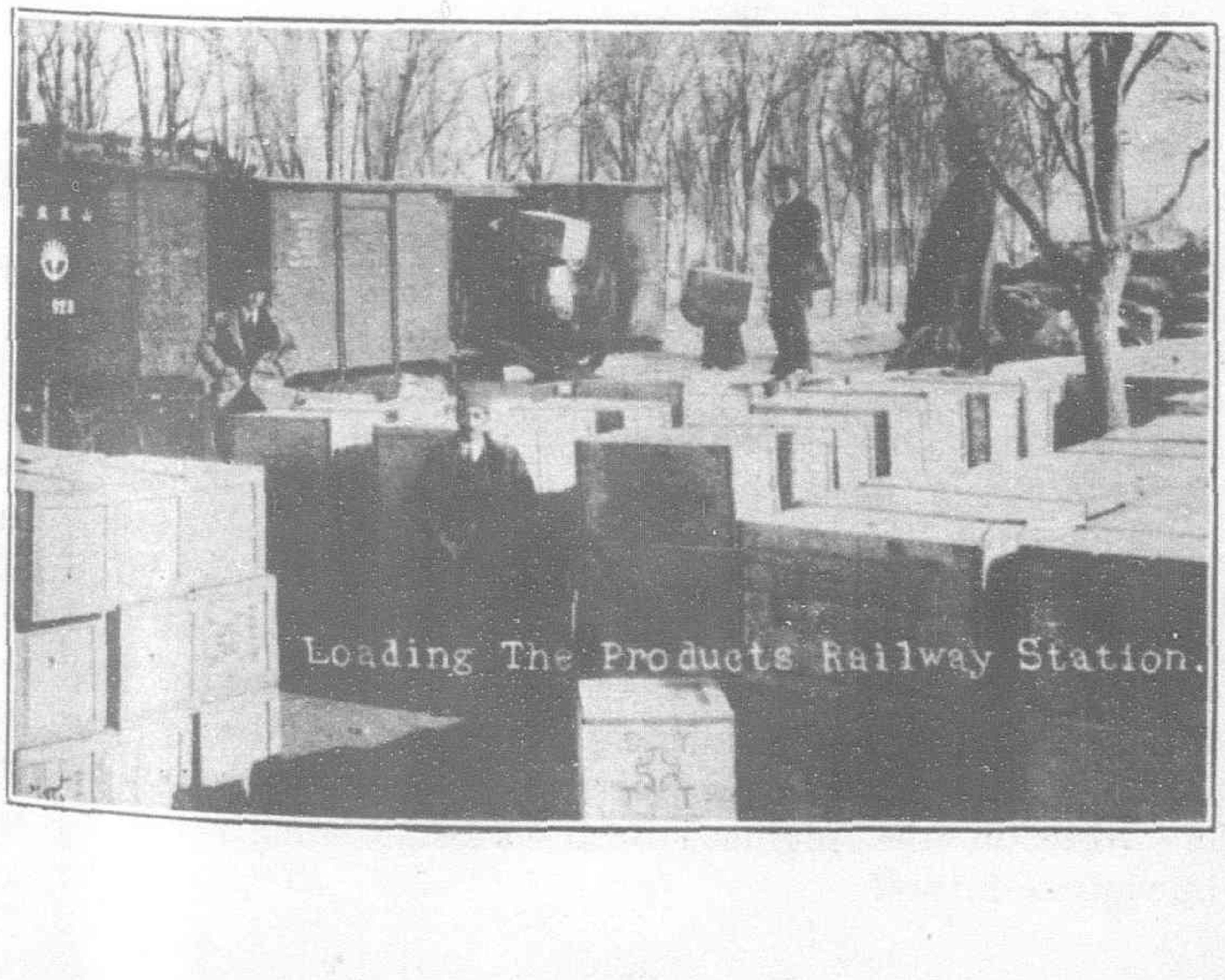
*The Haikwan Tael has risen in value from* 3s. *or* $0.74 *gold in* 1912 *to* 6s. 9½*d. or* $1.24 *gold in* 1920.

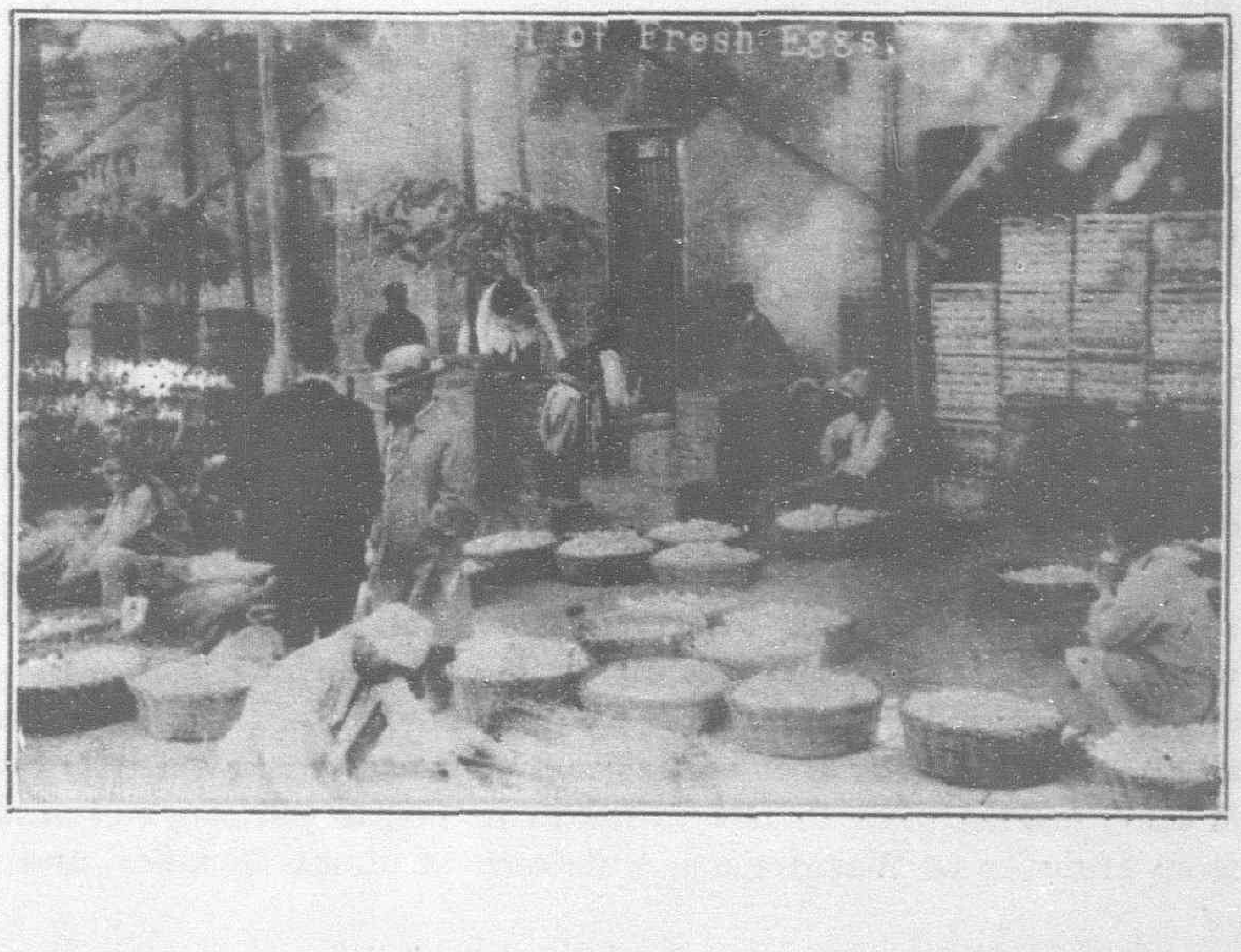
The chief egg-producing districts in China are the provinces bordering the Yangtze and Yellow Rivers, with Hankow, Kiukiang, Wuhu, Nanking and Chinkiang as the centres. Shantung also maintains a thriving industry, computed by a Japanese estimate to deal in 126,000,000 eggs yearly, 75 per cent. of which is exported. These are the principal areas engaged in poultry rearing, but as a matter of fact the trade is general throughout the country, and almost every farmer makes it one of his side-lines. The eggs are sold to collectors who travel throughout the provinces for this purpose.

Egg products as an industry came into prominence before the Sino-Japanese war of 1895. At this time the Germans were the promoters of various undertakings in the Yangtze valley and maintained a first position till the European war. Then the Americans began to take a lively interest in the business, and at the present time nearly four per cent. of the American imports from China are dried and frozen eggs. An investigation conducted in 1920 revealed the fact that there were nine American egg factories in China, this figure being the highest for foreign ownership. In addition, the Americans claim seventeen of the principal exporters of egg products from China, the next position being held by Great Britain with ten. Nowadays, however, the Chinese are displaying extreme activity in controlling the trade. Egg product factories are springing up everywhere, and, although the majority are far from modern in their equipment, the interest that is evident throughout the country is calculated to intensify the present abnormal development.


The Toa Egg Drying Co., Ltd. Works at Tsinanfu, Shantung

Thus it may be anticipated that the exports of eggs from China will not maintain themselves at 1919's high figure. The egg product factories are diverting more and more eggs formerly destined for foreign countries into their own manufactures. It will be a question whether a more extended egg production can keep even the present margin for exports.


Loading The Products Railway Station.


of Fresh Eggs.

### Manufacture of Egg Products

The process of manufacturing the principal egg products (whole-egg powder, dried albumen, liquid yolk and dried yolk) is briefly as follows: After thorough cleansing the eggs are broken, and for individual manufacture of albumen and yolk the two are separated. After two or three days of fermentation, during which time the clear liquid settles and is drawn off, the high acidity of the albumen is neutralized by the addition of ammonia. The drying is then done in shallow metal pans, coated with vaseline, in rooms heated to a temperature of 140° F. The dried albumen is put up in tins of 100 pounds net each; these tins are packed two to the wooden box, which weighs 250 pounds gross and measures 7 cubic feet.

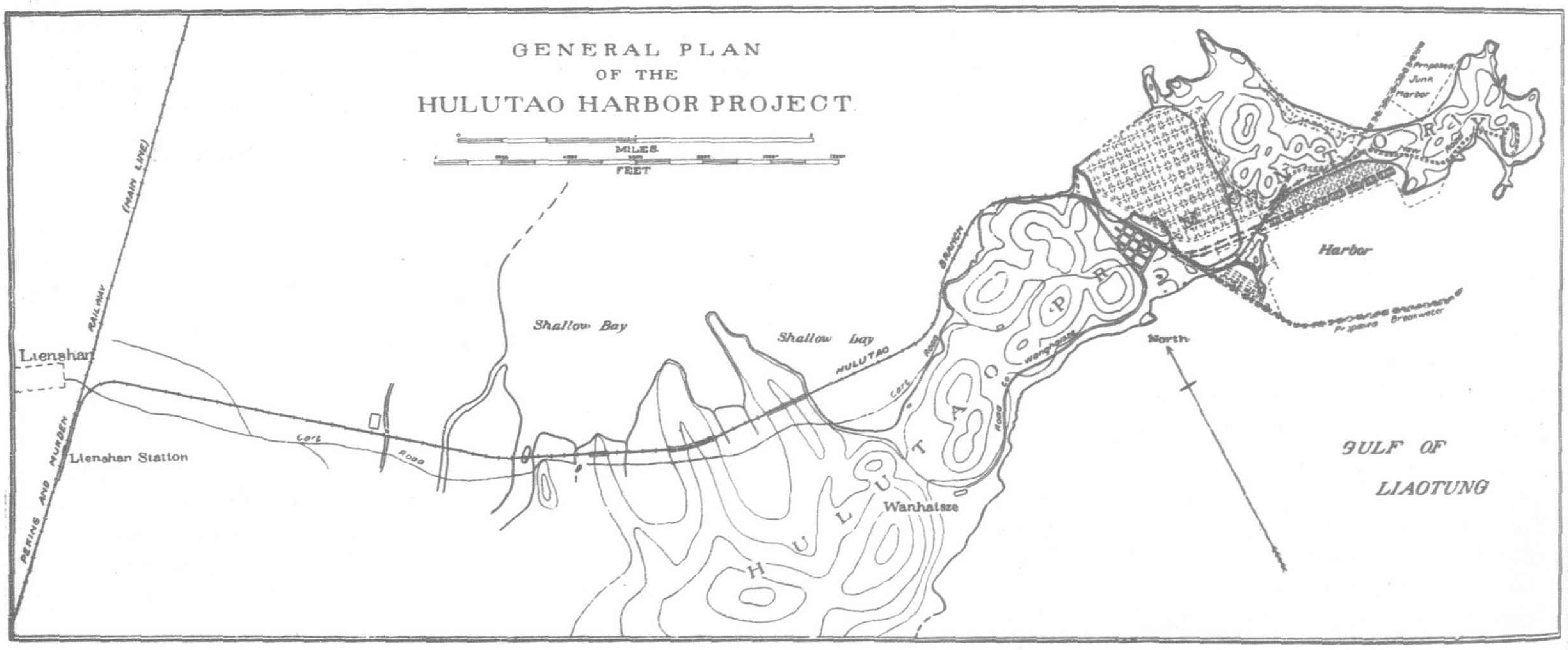
Liquid egg yolk is run through a series of graduated sieves so constructed as to leave the final product in practically liquid form which is treated with either a 2 per cent. solution of boracic acid or a 1 per cent. boracic acid and 9 per cent. salt solution, or sometimes a straight 12 per cent. salt solution, after which the yolk is mixed in wooden drums for 15 minutes. It is shipped in barrels weighing 500 pounds gross and 430 pounds net and measuring 12 to 14 cubic feet. Some factories guarantee the yolk to keep four months from date of shipment.

Dried yolk contains no chemicals and is manufactured by vacuum machines, about 51 yolks being required to a pound of powder.

# The Hulutao Harbor Project

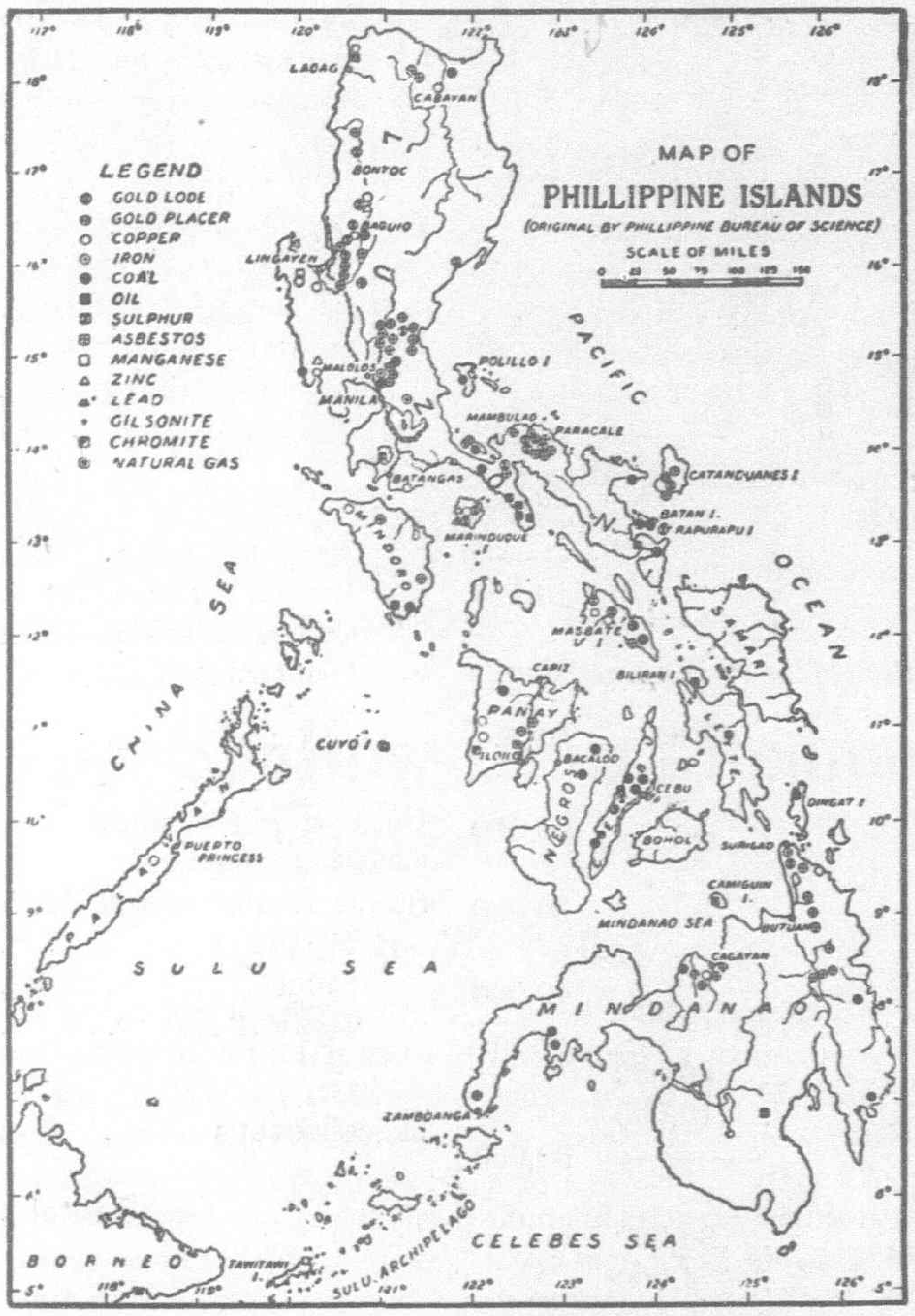
### From the Customs Reports

WORK was commenced at the end of October, 1910, and suspended on the 25th October in the following year. In this relatively brief period a standard gauge railway laid with 60-lb. rails was constructed between Lienshan station, on the Peking-Mukden Railway, and Hulutao, a distance of some 7½ miles; for about one-half of this distance the railway is laid on rock embankments or passes through deep cuttings. A cart road over the hills between these points was also completed. A seawall along the shore running parallel to the coast-line at low-water mark was constructed as a protection for the end of the railway line as it nears the breakwater approach, with which it is practically a continuation, as it makes a final connection between it and the base of the rocks forming the mainland. This wall was founded on concrete blocks built into place on the solid rock at low-water level. The blocks are each 30 feet long, and are said to contain 100 tons of concrete each. Two tiers were built for a length of 580 feet. The completed portion of the wall was 18 feet high, and the upper part was made a hollow subway 4 feet 6 inches wide and 6 feet high. Some 100 feet of this subway was constructed to finished level. The breakwater was carried out to a length of 930 feet—350 feet of it being 16 feet high, 350 feet 10 feet high, and the remaining 230 feet 5 or 6 feet high. It is built over a reef of rocks running outward from the shore and is composed of concrete blocks of about 100 tons weight each, built in place and keyed together. A good graded road 20 feet broad in its centre portion was made from Hulutao to Wanghaiszu, a distance of about 3 miles, and it was anticipated that Wanghaiszu, with its picturesque situation and abundant water supply, would prove an attractive locality for private residences, etc. In addition, a pathway some 10 feet wide was made along the face of the hills, forming the promontory at Hulutao, thus giving access to it for its whole length, some 3 miles in extent. The water supply at Hulutao was found to be neither sufficient nor reliable. A copious supply could, however, be drawn from the Lienshan River, some 3 miles distant. Four permanent two-storied buildings constructed of concrete blocks, including an hotel of good appearance containing 19 bedrooms, in addition to dining, drawing and billiard rooms, were completed by the beginning of 1912. In addition, telegraph and telephone lines were laid connecting Hulutao with Lienshan station. When the work was suspended, at the end of 1911, it was anticipatd that another year's work would have advanced the breakwater sufficiently to enable the first ship that arrived to come alongside. In these circumstances it seems lamentable that work costing some $470,000 has been suspended since the end of 1911 and the fruits of previous endeavors left unsupported to battle with the elements. The partially completed seawall now presents a very dilapidated appearance and is seriously broken in parts. The branch railway to Lienshan station, on the Peking-Mukden line, the cart roads to Lienshan and Wanghaiszu, the branch telegraph and telephone lines, all give evidence of neglect during the past decade, and there would seem to be little or no prospect of work on the Hulutao harbor scheme being renewed in the immediate future.



# Philippine Coal Supply

A MOST interesting and valuable compilation of facts and figures about the coal supply of the Philippines is contained in a booklet issued by the Manila testing laboratory. During the year 1920 more than Pesos 9,000,000 worth of coal was paid for according to the valuation of this laboratory which has now become of prime importance to the industries of the Islands. Since its inception, the laboratory has analyzed over a million and half tons of coal for its clients, and all the principal coal mines in Australia, Borneo, China, Manchuria and Japan have been visited and the coal sampled. The methods of sampling, analyzing and the laboratory apparatus is the same as recommended by the American chemical society and use by the United States bureau of mines. In the various instances where a comparison was made of the analysis of the Manila laboratory and the government bureau, the average difference in calorific value did not exceed one-half of one per cent. For this reason, and also because of a close agreement between the two laboratories, the analysis of the Manila laboratory can safely be used in bidding under government specifications to the U. S. army quartermaster department. The service performed by this laboratory for its clients consists of drawing and enforcing contracts for the delivery of coal, giving advice and information about the coal market, and assisting the purchaser to secure the most suitable coal for his requirements at the lowest price.



Below are given the results of coal examinations made for the principal clients. The penalties collected, because of the delivery of coal of lower value than the guarantee, due to inferior quality or substitution, averaged P.0.85 per ton, which is more than six times the laboratory charge of P.0.13.

*Calendar Year 1920*

| Name of purchaser. | Tons purchased. | Net penalty collected. | Cost of expert and laboratory. |
|---|---|---|---|
| Iusular Government .. | 58,317.98 | P.68,801.54 | P. 7,581.33 |
| Manila Railroad Company | 76,612.01 | 70,560.59 | 9,959.56 |
| Manila Electric Company | 89,841.61 | 50,635.49 | 11,679.41 |
| Total .. .. .. | 224,771.60 | 189,997.62 | 29,220.30 |
| Per ton .. .. .. .. | | 0.85 | 0.13 |

Adding to the above tonnage that of smaller clients and also the examinations made for coal companies will bring the total tonnage handled by this laboratory to approximately one-half half of the total imported into the Philippine Islands.

* * *

The source of the Philippine coal supply varies every few years; the product of certain countries rise, flourish and are replaced by others in conformity with economic conditions. The laboratory records contain data on a great many more coals than here shown as many coals from Japan and other countries, formerly sold in large quantities, are not now imported. It was in anticipation of the Australian revival that the writer (who did not come to the Philippines until 1910) visited Australia in 1919 in order that reliable and exact information about all of their coals would be available. From 1903 to 1910 nearly all of the coal came from Australia, amounting to over 300,000 tons in 1908, 90 per cent. of the total importation for that year. When the post-Russian-war embargo in Japan was lifted however, Japanese coal commenced to replace Australian, and, since 1912, has supplied, with the exception of one or two years, 70 per cent. of the total importation, the Australian coal disappearing from the market in 1916. The year 1920 witnessed the first serious attempt of Australia to enter this market again, 130,000 tons being imported as compared to 20,000 tons in 1919; but, owing to government restrictions, it is now impossible to get the best quality, Maitland, and very difficult to get Borehole coals, only inferior coals being offered.

Manchurian (Fushan) coal, from 1913 to 1918 inclusive, averaged 45,000 tons per year, but, owing to other demands, has disappeared from this market, being replaced by Formosan coal, which began in 1918 and increased to 77,000 tons by 1920. Indian coal was first imported in 1919, 5,000 tons, and in 1920, 31,000 tons, but at present there is an embargo on exportations. British Borneo (principally Sebatick) commenced in 1908 and has since supplied this market annually with from 3,000 to 18,000 tons. North China coal (Kaiping field) entered this market in 1912 and has since averaged 50,000 tons per year. From time to time cargoes of coal have been brought in from South Africa, Dutch Borneo, French China and other Chinese fields but have proved to be either of inferior quality or else unsuited to the requirements of this market. Four years of exorbitant prices for imported coal, about 300 per cent. above pre-war prices, have not been able to raise the production of Philippine coal mines above an insignificant figure. This is partly due to scarce, inefficient and expensive labor, but, principally, to physical conditions which only permit of mining on a small scale and make the overhead charge per ton excessive.

The tonnage for the year 1920 given in this article does not agree with that from other sources, but is correct, since it was tabulated from reports made by each contractor of the cargoes that he purchased for his own business. The reports give time of arrival, name of vessel, port of shipment, tons in cargo, etc., and most of these cargoes could be checked by the records of this laboratory.

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* The ton used throughout this article contains 2,240 pounds, or its recognized equivalent in the Philippines, 1.016 kilos. The par value of the Philippine Peso (P) equals $0.50 United States currency.

*Individual Imports of Coal*, 1920.

| Contractor. | Tons. | Per cent. |
|---|---|---|
| Madrigal & Co. | 247,003 | 39.23 |
| Mitsui Bussan Kaisha | 227,121 | 36.07 |
| Pacific Commercial Co. | 52,292 | 8.30 |
| H. R. Andreas | 23,548 | 3.74 |
| Grimes & Co. | 10,180 | 1.61 |
| Macondray & Co. | 8,155 | 1.30 |
| W. F. Stevenson & Co. | 4,901 | 0.78 |
| Hoa Hin Co. | 2,500 | 0.40 |
| Metzi Bordman Co. | 2,041 | 0.32 |
| Direct importation for private use | 15,524 | 2.47 |
| U. S. Navy (United States coal) | 36,399 | 5.78 |
| Total importation | 629,664 | 100.00 |

*Coal Mined in the Philippine Islands*, 1920.

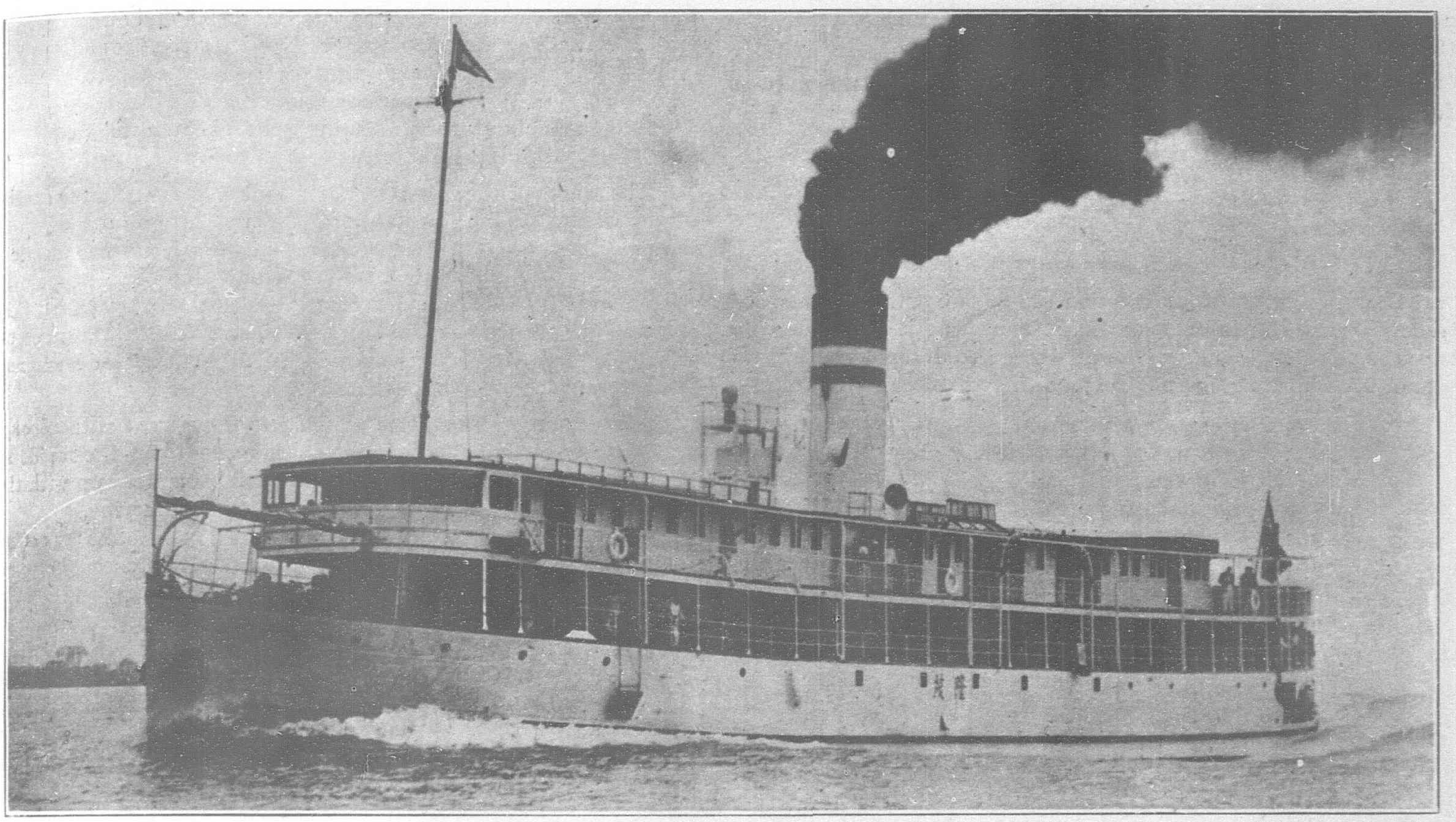
| Mining Company. | Island. | Mined at— | Tons. | Tons. |
|---|---|---|---|---|
| National Coal Co. | Mindanao | Malangas | .. | 3,075 |
| do. | Cebu | Compostela | 2,831 | |
| Uling Coal Mines, Ltd. | do. | Uling | 2,978 | |
| J. Clayton Nichols | do. | Toledo | None | |
| D. M. Carman | do. | Danao (estimated) | 2,239 | |
| | | | | 8,048 |
| Philippine Coal Mining Co. | Batan | Batan | .. | 35,000 |
| Total | | | | 46,123 |

*Distribution of the Normal Coal Consumption of the Philippine Islands*

| Consumer. | Tons. | Tons. |
|---|---|---|
| U. S. Army: | | |
| Manila | | 90,000 |
| U. S. Navy: | | |
| Cavite and Olongapo | | 50,000 |
| Insular Government: | | |
| Manila and Outports | | 40,000 |
| Railways: | | |
| Manila Railroad | 80,000 | |
| Philippine Railway | 10,000 | |
| | | 90,000 |
| Electric Plants: | | |
| Manila Electric Company | 80,000 | |
| Iloilo Electric Light Company | 4,000 | |
| Visayan Electric Light Company | 2,000 | |
| Cavite Electric Light Company | 2,000 | |
| | | 88,000 |
| Cement works (estimated) | | 6,000 |
| Oil mills (estimated) | | 10,000 |
| Gas Works: | | |
| Manila Gas Corporation | | 8,000 |
| Ice Plants: | | |
| Philippine Cold Storage | 3,000 | |
| Fabrica de Hielo de Manila | 4,500 | |
| Cebu Ice Plant | 1,000 | |
| Iloilo Cold Storage | 1,000 | |
| | | 9,500 |
| Cigar and Cigarette Factories: | | |
| Cia. Gral. de Tabacos de Filipinas | 2,500 | |
| Germinal | 1,000 | |
| La Insular | 1,000 | |
| El Oriente | 500 | |
| Alhambra | 500 | |
| La Yebana | 500 | |
| Helios Cigar Factory | 250 | |
| La Flor de Intal | 250 | |
| | | 6,500 |
| Breweries: | | |
| San Miguel | 5,000 | |
| Oriental | 2,000 | |
| | | 7,000 |
| Distilleries: | | |
| La Tondeña | 1,200 | |
| Ayala y Cia. | 3,500 | |
| Watson | 500 | |
| Los Baños | 500 | |
| Ynchausti | 700 | |
| Legarda | 400 | |
| | | 6,800 |
| Sugar Factories: | | |
| Silay Sugar Central | 1,500 | |
| Ynchausti | 2,500 | |
| Calamba Sugar Estate | 1,000 | |
| Pampanga Sugar Mills | 1,000 | |
| Mindoro Sugar Company | 3,000 | |
| San Carlos Milling Company | 2,000 | |
| | | 11,000 |
| Engineering Works: | | |
| Atlantic, Gulf and Pacific Co. | 3,000 | |
| Earnshaw's Slipway | 1,000 | |
| Sanitary Laundry Co. | 1,000 | |
| Colorado Mining Co. | 1,000 | |
| San Carlos Iron Works | 500 | |
| | | 6,500 |
| Sawmills: | | |
| Derham Lumber Co. | 800 | |
| Insular Lumber Co. | (?) | |
| Cadwallader-Gibson Lumber Co. | 1,200 | |
| Oriental Sawmill | 500 | |
| | | 2,500 |
| House coal, etc. | | 10,000 |
| Ocean-going steamers | | 15,000 |
| Coasting steamers | | 69,800 |
| Steam Launches and Ferries: | | |
| Manila | 15,000 | |
| Cebu | 10,000 | |
| Iloilo | 10,000 | |
| | | 35,000 |
| Miscellaneous | | 8,400 |
| Grand total | | 570,000 |

## Hunchun Improvements

THE road construction bureau, says the customs reports, established in 1919 for the improvement of communications, seems to have limited its activity during the year to the collection of the road tax on carts. On the other hand, the Korean authorities have been energetically pushing the improvement of communication on their side of the frontier. The seaport of Ungi, some 60 *li* south of the Tumen, was opened in the summer to foreign trade and residence and is now visited by the larger steamers of the Japan-Korea coasting lines which formerly terminated their run at Seishin. Also, a road has been practically completed which will greatly facilitate wheeled traffic between Kamisambo, the present northernmost terminus of the Seishin-Huining Railway, and Keigen, a town in Korea facing Hunchun at about 40 *li* distance. Towards the end of the year an electric-light plant was installed in town by a Chinese concern, with the assistance of two Russian mechanics. It supplies light for public and private use, and power is supposed to be also available for operating a flourmill and a sawmill. If successful, the venture may initiate an era of industrial development in the district.



S.S- "Loongmow" on the Measured Mile. Speed 15.1 Knots

# Improved Type Shallow-Draft Steamer for Upper Yangtze River

### By H. P. KING

THE industrial nations of the world are taking an increasing interest in the development of the natural resources of China, which is becoming to be regarded as the world's greatest potential market for machinery, engineering material and manufactured goods generally, and as a country which can supply the world with vast quantities of raw material. Before these natural resources can be developed, however, China must be furnished with far greater transportation facilities than she now possesses. Great railway projects are under consideration, and will, no doubt, be put in hand once the political and financial conditions in China permit of the safe investment of foreign capital. For the present, however, we are concerned more with the utilization of China's vast waterways and the developments that have taken place during the past few years are very interesting. A very good example is the development of steamship facilities on the upper reaches of the Yangtze River. Not only is this development interesting from the point of view of increased transportation facilities but also because of the technical problems that have had to be solved by marine engineers and shipbuilders before a suitable type of steamer was evolved for the service.

Up to May, 1920, there were four small steamers of a special type plying between Ichang and Chungking, the nearest river port of Szechuan, which is generally regarded as China's wealthiest province. While these four vessels filled a long-felt want they were not sufficient to meet the increasing passenger and freight traffic, and it became obvious that an improved and more powerful type of steamer would have to be provided. The problem to provide this improved type of vessel was not an easy one to solve; this will be apparent when the natural conditions prevailing on the river are considered.

The distance between Ichang and Chungking is about 400 miles, and the rise in the water level between those two ports is, in normal conditions, 500-ft., and, on occasion, may rise to 600 or 700-ft. The depth of water between the end of November and the end of April, when the melting snows in the mountains of Thibet cause the water to rise very rapidly, is insufficient for vessels of more than very shallow draft. The normal current between Ichang and Chungking is generally between four and eight knots, and at times is as high as 13 knots in the rapids. Bearing these facts in mind it will be realized that vessels, to be successful in this trade, must be of shallow draft, of high engine power, and of exceptional steering abilities. Owing to the ever-present danger of striking the numerous rocks in the rapids they must be provided with adequate protection in the shape of watertight bulkheads. It is true that these problems have been solved to some extent for dealing with less exacting conditions in other parts of the world, but nowhere else are the conditions as they are on the Upper Yangtze, and all the more credit is therefore due to those who have successfully surmounted the difficulties that have had to be faced before an entirely satisfactory type of steamer was produced. These difficulties were overcome with careful study and observation, and we give the details of this new type of steamer which has proved very successful on the Upper Yangtze service. This vessel, the *Loongmow*, belonging to Mackenzie & Co., of Shanghai, and built and engined by the Kiangnan Dock & Engineering Works, of Shanghai, completely revolutionized all previous ideas on the subject of steam navigation through the Yangtze Gorges, and proved an immediate success. So much so, indeed, that immediate orders were placed with the Kiangnan Dockyard for four duplicates, and in July last two further vessels of the same type were ordered by Japanese interests.

The vessel is subdivided into nine watertight compartments by eight transverse bulkheads. Passenger accommodation is provided for 16 first-class foreign passengers, 40 first-class Chinese passengers, 80 second-class Chinese passengers, 100 third-class Chinese passengers, 200 steerage or deck passengers.

The dimensions of the *Loongmow* and her sister ships are as follows :--

| | |
|---|---|
| Length, overall.. .. .. .. | 204-ft. 11-in. |
| Beam .. .. .. .. .. | 31-ft. |
| Deadweight (capacity) .. .. | 400 tons |
| Speed .. .. .. .. .. | 15 knots |
| I.h.p. .. .. .. .. .. | 3,300 |

The machinery installation consists of two sets of high-speed tri-compound engines of 3,300 i.h.p., and steam is generated by two Thornycroft boilers working under forced draught and a pressure of 250-lb. per sq. inch. The following auxiliaries are fitted :—

One Weir mono type air pump.
Two Weir feed pumps, with surface feed-heater.
One Weir evaporator.
Independent circulating pump.
Two electric generating sets, one steam and one oil-driven.
Auxiliary steam pumps for general service, fire and salvage.
One steam warping capstan specially adapted to warp the vessel over the rapids if necessary.
Steam and hand steering gear of builders' design for this special service.

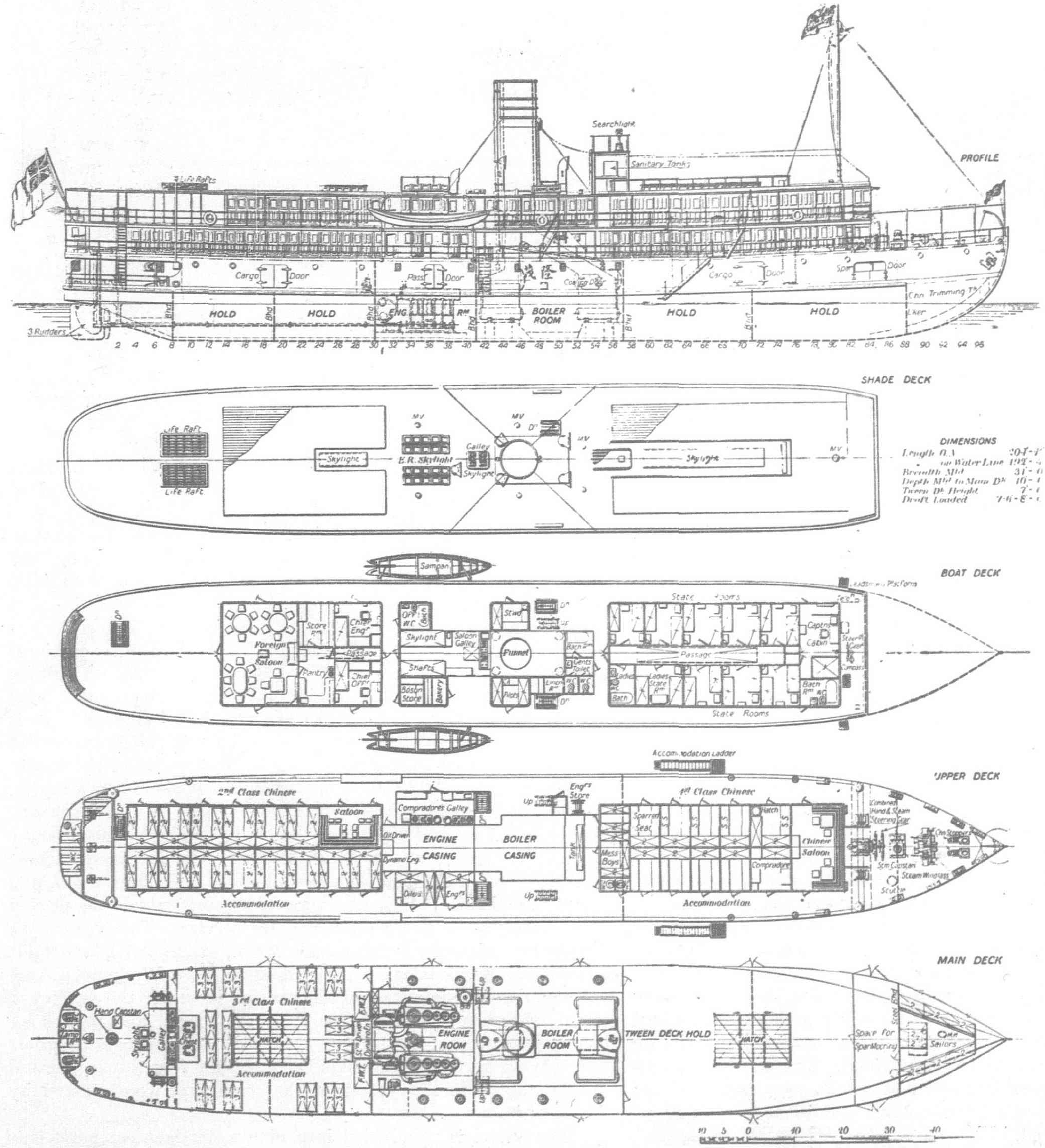
The whole of the machinery and hull were built under special survey of the British Corporation for the survey and registry of shipping, and has the Corporation's highest river classification. The *Loongmow* is understood to be the first ship of this type ever classed by any classification society. Since then the British Corporation has classed four similar vessels, and the American bureau of shipping two vessels of the same type, all built by the Kiangnan Dock & Engineering Works at Shanghai.

The vessels on the service previous to the advent of the *Loongmow* and her sister ships had all to be warped over the rapids at one time or another, but, though the *Loongmow* went up with the highest water level on record she did so without warping.

The actual distance between Ichang and Chungking is 392 miles, and the *Alice Dollar* commenced her service on the run by doing the round trip from Ichang to Chungking and back in four days and 12 hours, this was repeated by the *Kiangking* on her maiden voyage. This record has, however, been beaten since by the *Loongmow* by six hours. The *Alice Dollar* has made the run between Ichang and Chungking in 37½ steaming hours.

The two vessels now building for the Kaiyosha Company, of Japan, are designed to carry 380 tons d.w. on 7-ft. draft, and to steam 14 knots. The steamers are being provided with tackle to handle lifts of five tons.

It is very interesting and pleasant to record that this development in shipbuilding is largely due to the friendly rivalry of Yarrow & Co., of Scotstoun, and the Kiangnan Dock & Engineering Works, of Shanghai.



**Shallow-Draught Steamer "Loongmow," for service on the Upper Yangtse River, China. Built and Engined by the Kiangnan Dock & Engineering Works, Shanghai**

# The Pneumercator System

THE pneumercator system has been designed primarily to provide means for the indication at a distant point or station of the quantity of liquid stored in a tank or other vessel.

For example, on shipboard it is employed for the indication in the boiler room or engine room of the quantity of fuel oil in the fuel oil bunkers and settling tanks.

Again in the case of large storage tanks for fuel oil, say on the riverside, the system is applied to indicate the weight of oil in the tanks, the indicating gauge being placed in the office of the superintendent, or other convenient position.

The pneumercator system is an interesting application of the pneumatic transmission of hydrostatic pressure due to a column of liquid to a distant observing station whether the liquid column be the height of a tide, the level of a river or reservoir, the depth of valuable liquid in a storage tank employed in some industrial process, the fuel oil in a ship's bunker, or otherwise.

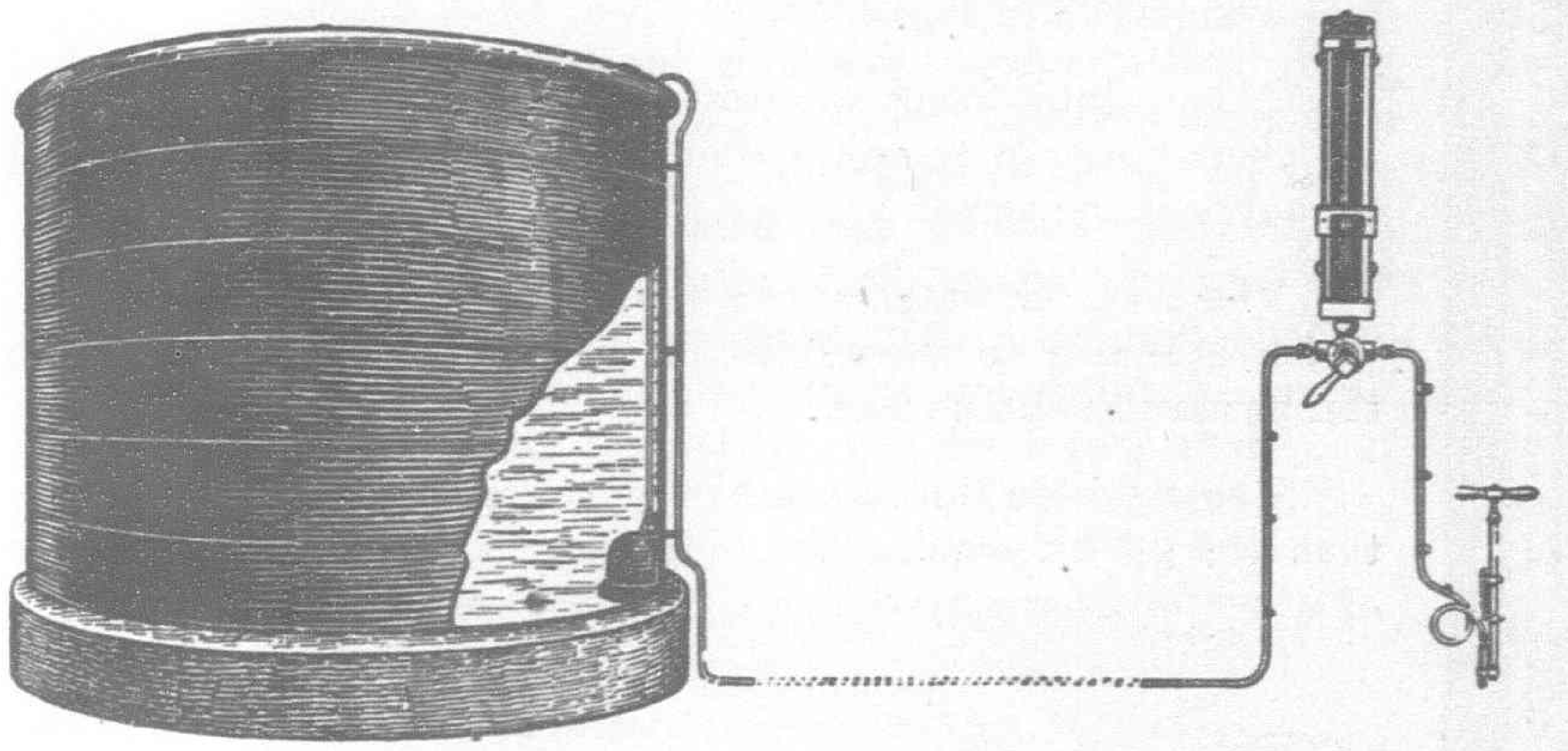


Fig. 1. General Features of the Pneumercator Apparatus

The essential features of the normal apparatus are illustrated in Fig. 1.

The inverted hollow hemispherical vessel (1) is fixed at or near the bottom of the tank. In its side a sharp edged orifice is cut which forms the datum or zero line from which measurements are made.

To this "Balance Chamber" as it is styled, a small air pipe (2) is connected and led away to the distant indicating gauge (3). This pneumercator gauge is a robust form of mercury column pressure indicator.

Near the gauge is located a hand operated air pump connected up to the system by means of a control cock (4) which is an important feature of the system.

The elements of the system are of extreme simplicity and the principle of operation is as follows:

Imagine the tank empty and that liquid is pumped in—as soon as it covers the sharp edged orifice air is trapped in the balance chamber.

As the level of liquid rises in the tank the head of liquid above the orifice impresses a corresponding pressure on the imprisoned air, which pressure is transmitted by the small air tube to the mercury indicating gauge. (Fig. 2.)

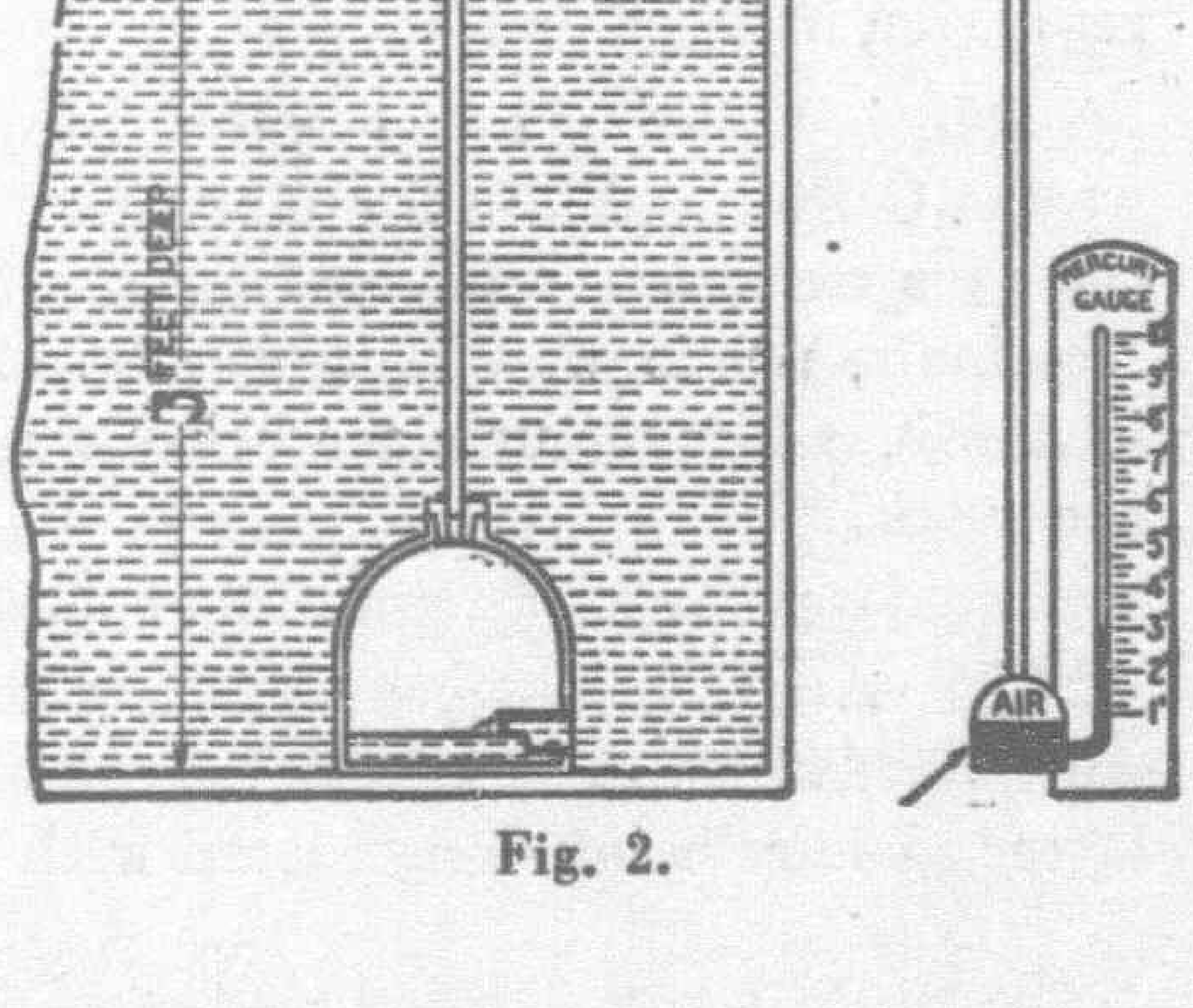


Fig. 2.

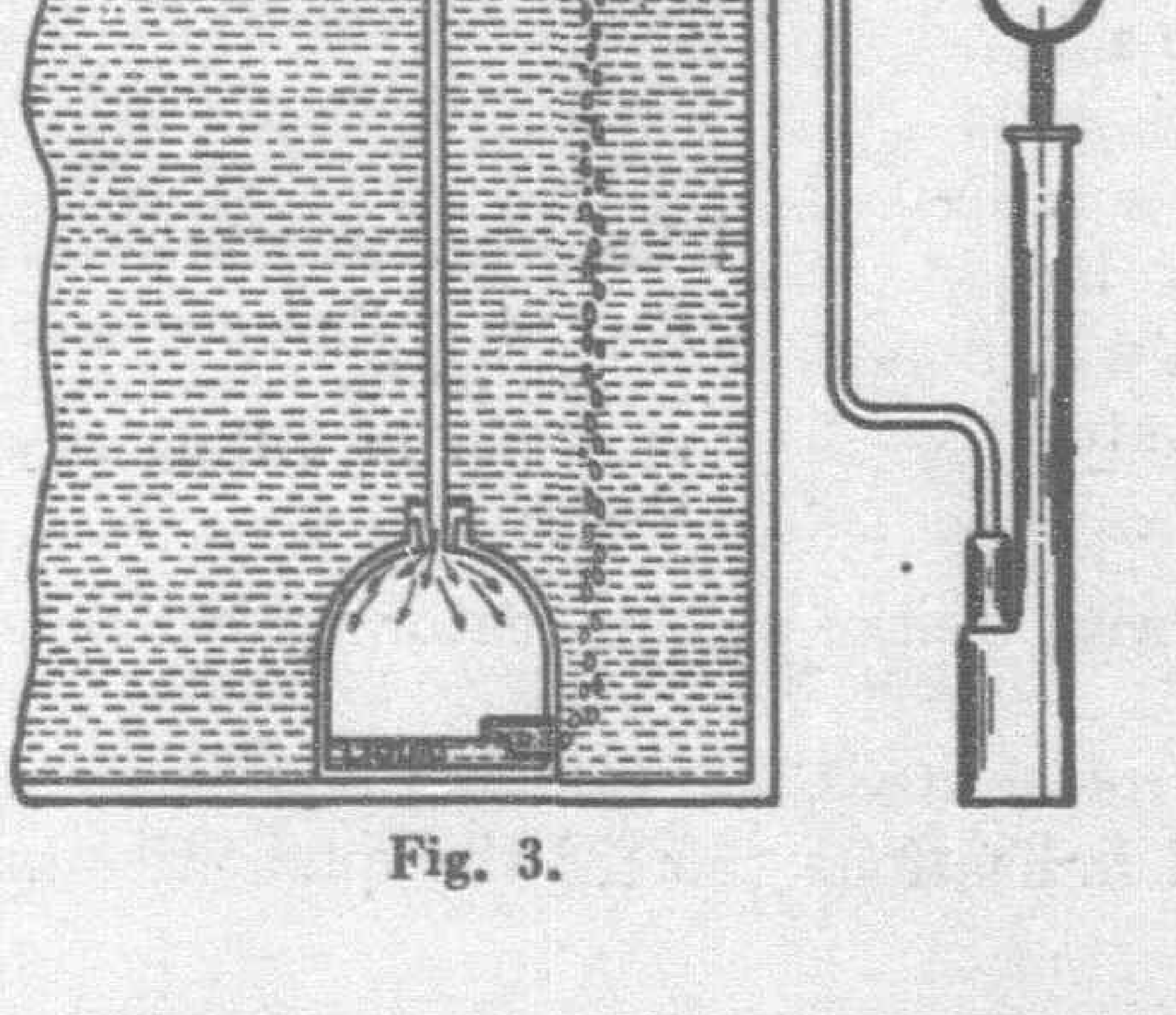


Fig. 3.

The control cock (4) allows of this pressure being applied to or cut off from the gauge or again allows of the gauge being isolated and vented to atmosphere. It further allows of the air pump being connected directly to the balance chamber by way of the air piping (2).

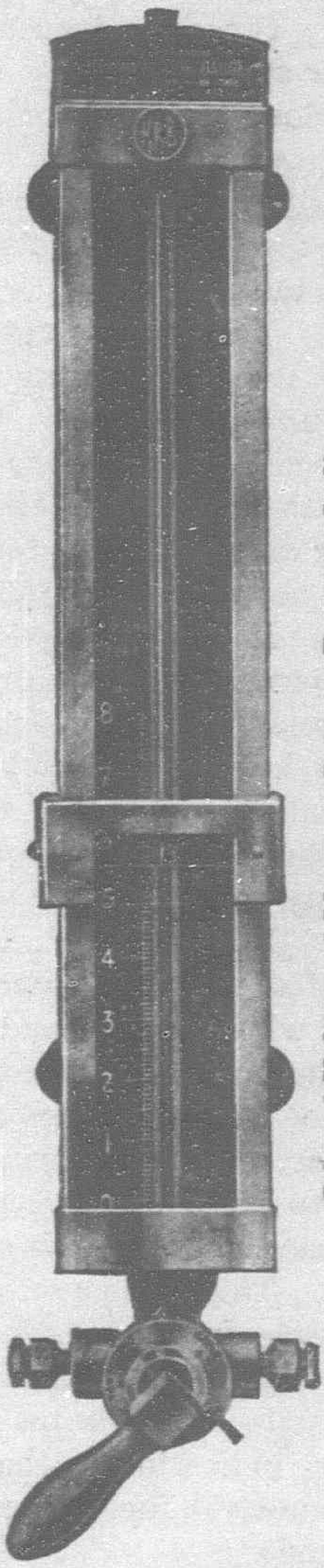
Since, as the head of liquid and consequently the pressure on the imprisoned air, is increased, its volume will decrease, liquid will enter the balance chamber and thus cause a false datum of measurement by raising the liquid level in the balance chamber slightly above the orifice or datum level.

This is overcome by the provision of a simple hand air pump, which, used in conjunction with the gauge control cock, allows of air being pumped into the system so that the liquid in the balance chamber is depressed to the sharp edged orifice and thus the datum in measurement is maintained.

A few strokes of the pump are made before each reading so that all readings are made with a perfectly definite datum of measurement.

During the use of the air pump any excess air pumped in freely bubbles out at the balance chamber orifice and does not affect the datum level. (Fig. 3.)

By means of the control valve the air pumped into the system is deflected past the gauge, so that no air flow through or over the indicating mercury which would tend to exodise the mercury and render it sluggish in the gauge indicating tube, is allowed.



Control Valve and Mercury Column Pressure Indicator

The control valve is now turned to connect the balance chamber to the gauge so that the pneumatic pressure in the balance chamber due to the head of liquid above its orifice (and datum level) is transmitted through the air tubing to the mercury gauge and the mercury column rises to a height exactly equivalent to the head of liquid in the tank.

By putting the control cock to "vent" the mercury chamber as well as the upper end of the indicating gauge tube are opened to atmosphere and the mercury falls to the datum level zero on the gauge scale. Thus the gauge zero can be checked at any time.

The operation of the air pump before taking a reading ensures the correct maintenance of the datum level in the balance chamber. If insufficient air had been pumped in the fact is disclosed by repeating the operation where a higher reading on the gauge will be obtained, thus the gauge is self-checking.

Changes of temperature of the air line system have no effect on the accuracy of the gauge. If, for example, the air line is heated up the air in it expands and the excess volume bubbles out at the balance chamber orifice. If the air line is cooled and the air in it contracts, the tank liquid rises very slightly in the balance chamber, but when the air pump is operated for the next reading the air volume is restored and the datum level regained.

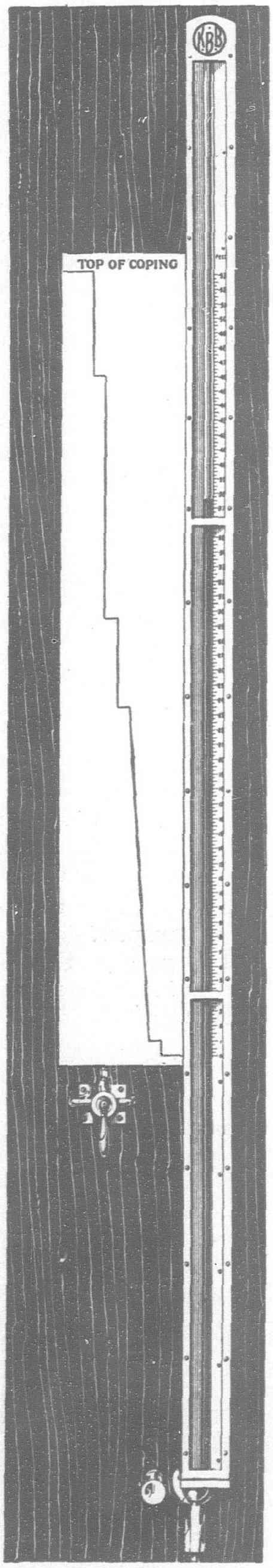


**Fig. 4. Pneumercator Guage to Register Level of Water in Filling Dry Decks.**

Since the transmitting medium is air only, the gauge may be above or below the tank or at any reasonable distance from it.

The gauge may be scaled not only to read depth, but also weight or volume of tank contents.

The pneumercator system permits of coupling one indicating gauge to a number of tanks where this is convenient, the gauge being connected with any one of the tanks as desired by means of "selector" valves operated at the observing station.

It can be applied to tanks under internal pressure or vacuum, the internal pressure being compensated for by leading a second air tube from the tank top to the top of the gauge column, leaving the actual liquid head only to operate the mercury column.

When desired, the gauge may be fitted with an annunciator by means of which alarms and signals are given when pre-determined levels of liquid in the tanks are reached. The gauge mercury column brings this alarm gear into action, no wiring or contacts at or near the tank being required.

This particular system has been in successful use for some seven years and a large number of oil fuelled ships are fitted with the pneumercator system for indicating in the boiler or engine rooms the fuel oil bunkers and settling tanks.

An installation of particular interest is that fitted on board the R.M.S. *Aquitania*, where some 46 tanks are dealt with.

Another installation of interest is that on board the U.S.S. *New Mexico.*

The applications to liquid measurement in tanks and reservoirs on land have been very extensive and such liquids as

Fuel oil
Tar oil
Tar
Paraffin oil
Crude oil
Tempering oil
Petrol
Benzol
Alcohol
Methylated spirits
Cottonseed oil
Castor oil
Linseed oil
Olive oil
Etc.

Ether
Liquid ammonia
Vinegar
Milk
Molasses
Sulphurous acid
Sulphuric acid
Phosphoric acid
Nitric acid
Caustic soda
Brine solution
Bleach liquor
Fresh water
Sea water
Etc.

have been successfully dealt with by the pneumercator system described.

In many cases the control of stocks of valuable liquids from the office by having visual indications thereof the quantities in the various distant tanks controlled, has resulted in considerable benefit. Accurate knowledge at all times on the part of those in charge tends to detect leakages and promote efficient control.

Many tanks in factories carrying liquids used in manufacturing processes are difficult of access and measurements provided by the pneumercator system without necessity to visit the tanks and "sound" them have proved of the greatest value in the economical use of the liquids on the part of the employees.

A particular case, that of one of the large superelectric power stations is of interest. The boiler feed tanks were some 50-ft. above the boiler room firing floor and somewhat difficult of access. Several schemes for indicating these tanks on the firing floor were considered, but the mechanical complications rendered these schemes impracticable. By means of the pneumercator system this problem was solved in a most satisfactory manner, the air tubing being run like ordinary electric light wiring.

The case of dry dock control may also be cited. A pneumercator gauge fixed in the pump house enables the pump operator to know at any moment the level of water in the dock. The gauge is sometimes made to give a graphic picture of the state of the dock by means of a profile of the dock (to scale) affixed to the gauge as shown in Fig. 4.

A very interesting application of the system is to indicate in the chart house of captain's room on board ship, the fore and aft draughts of the vessel.

The head of water above the ship's keel operates the gauge which is scaled to show draft in feet and inches and such scale can be read to half an inch.

The precision thus attained is of course very much greater than that yielded by reading the hull draught marks, the observation of which is often very difficult, especially at night.

# Construction Work in China

In keeping with conditions obtaining in many other portions of the world, Shanghai, the commercial metropolis of the Far East, was, with the completion of the war, short of housing accommodations. During 1920 twice as much building was undertaken as in 1919, and in 1921 double that for 1920. It is safe to estimate that the equivalent of $50,000,000 silver was put into dwellings in Shanghai during 1921, providing for nearly 500 modern foreign-style residences and probably 5,000 Chinese houses, in addition to much construction in business buildings, warehouses and industrial plants. Next after Shanghai, Harbin witnessed the greatest activity, spending probably $30,000,000 silver in this connection.

Quite in contrast is Mukden, where the South Manchuria Railway during the past few years built in excess of the city's demands, so that to-day scores of modern expensive buildings stand in the Japanese section of the city unoccupied. Tsingtao also figured prominently during the year in construction work. Naturally all these building operations drew heavily on supplies of materials, particularly reinforcing bars, which accounts for the substantial reduction in stocks on hand at the beginning of the new year.

Much building construction has been completed or is under way at Canton. Plans for the improvement of the water front, for the construction of a bridge from Canton to Honam, and for railway terminals, public warehouses and industrial sites are worked out in detail, and overtures are being made to secure the financing of the work.

Work is proceeding on the construction of the blast furnaces at Chinwangtao, capacity 200 tons daily; Lungyen near Peking, capacity 250 tons daily; and Ta-yeh, capacity 500 tons daily. The latter two are being constructed with American materials.

THE FAR EASTERN MOTORS
*Supplement to the "Far Eastern Review"*
*Devoted to the Development of Automotive Interests in the Far East*

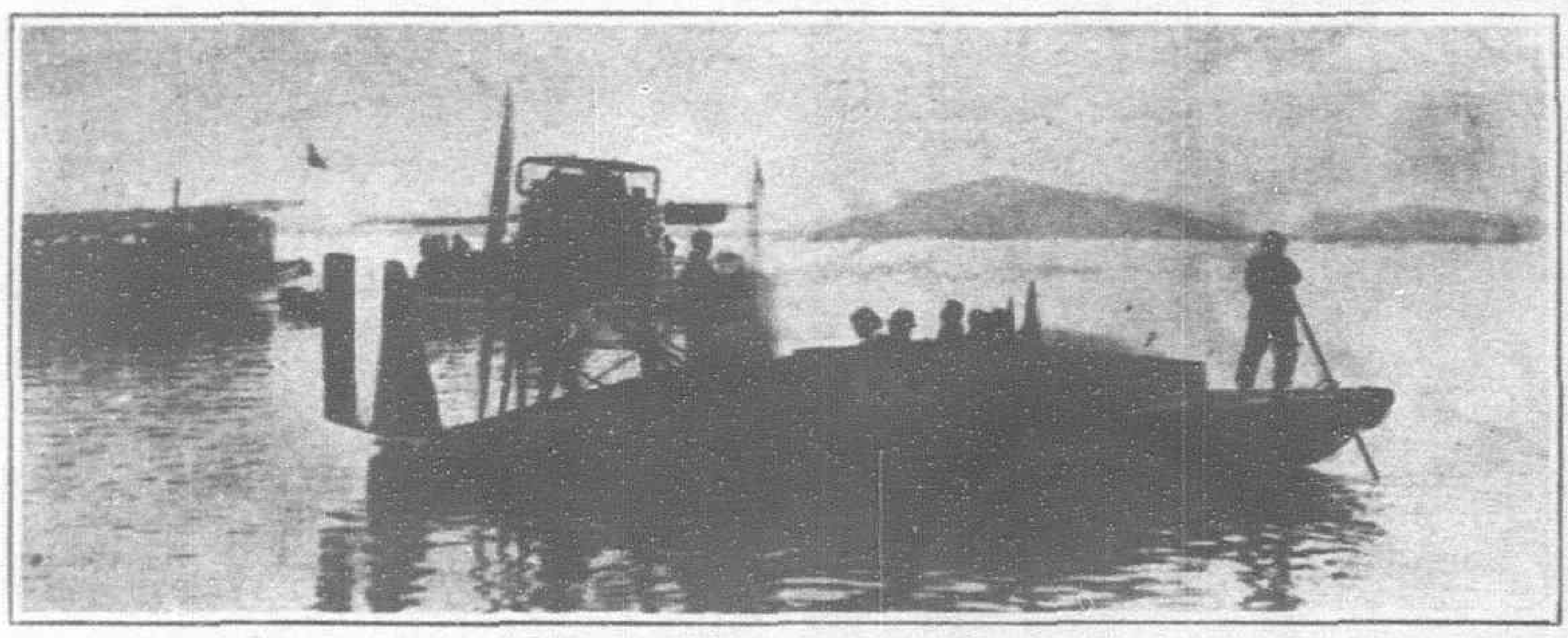
# The Hydro-Glider in China

## A Dumont-Galvin Performance on the Tsien-Tang River in Chekiang

*By Dr. E. L. Tartois*

CHINA'S transportation facilities are limited, railways are insufficiently developed and there are practically no roads. The construction of a suitable system of roads and railways will take much time and money, and for some years to come the wonderful net-work of rivers and canals must bear the burden of transportation. With the exception of the Yangtze, which lends itself to steam navigation (although with great difficulties in its upper reaches), all other rivers and their tributaries are filled with shoals and rapids, especially during the season of low water when they are navigable only by shallow draft junks poled or towed with great difficulty by coolies. Two methods therefore present themselves for the proper utilization of these inland waterways for the transportation of passengers and goods: the hydro-plane or the hydro-glider. Although more advantageous than the aeroplane for commercial uses, the carrying capacity of the hydro-plane is too small.

The hydro-glider is a boat of special design driven by an aerial propeller, and whose shape of hull permits it when driven at a certain speed, to lift almost completely out of the water thus avoiding the water resistance, which in the case of an ordinary boat, increases tremendously in relation to its speed. As its name indicates, the Hydro-glider, glides along the surface of the water. The builders of fast motor-boats long ago learned that with an increase of speed the boat lost some of its weight, and by successive trials improved the shape of the hulls in order to amplify this effect. The effect, however, of lifting the bow, plunged the stern deeper under the water by reason of the powerful suction exercised by the propeller. The resistance of the water on the hull increased so rapidly with the speed that even a slight increase was accompanied by a disproportionate increase in power.


The Fei-Long at Zakhou

Finally, the weight of the engine for a determined hull, added to the weight of fuel and the carrying capacity, that these high-speed motor-boats lost all commercial efficiency and became useless except for speed maniacs. The application of aerial propellers to aeroplanes and the hulls of sea-planes brought to light new principles in propulsion, especially the necessity of providing the bottom of the hulls with one or two "nicks" or steps (see Fig. 1). The function of these steps is to break the water pressure in several places, which, otherwise acts as a brake and reduces speed. Therefore, it was determined that aerial propulsion, shapes specially designed to decrease the friction of the water on the hull, with well calculated slopes of the planes, constituted the essential elements for the realization of a successful hydro-glider.

The principal advantages of the glider may be condensed as follows:

1. Sliding along the surface of the water, the glider is practically unaffected by currents, whirlpools or rapids. An ordinary boat going against a current of certain strength will have its speed reduced in accordance to certain formulae too long to explain here. On the other hand, the speed of the glider for the same scientific reasons is slightly increased.

2. Its draft at full speed, being practically nil, the glider can easily navigate streams which even a sampan would find difficult, thus making it the ideal means of passenger transportation and mails on shallow waters, with rapids, a feature of nearly all Chinese rivers.

On the other hand many gliders at the outset had certain disadvantages which limited their practical employment but which have been corrected until the boat is now highly efficient for commercial transportation. Foremost among the types which have entered the field in France and China and given excellent results, is the Dumont-Galvin glider. A description of this type follows:

Its chief characteristic is the new form of the hull, whose lines are very like those of a sharp nosed launch cutting the water. This machine marks the attainment of the goal sought after during a continuous study of its working under conditions corresponding to those actually encountered and is an interesting practical and commercial proportion.

The Dumont-Galvin machine is a fast and light glider, light enough to be hauled on a wheeled truck to its garage in drydock or to be transported on *terra firma* and towered into water.

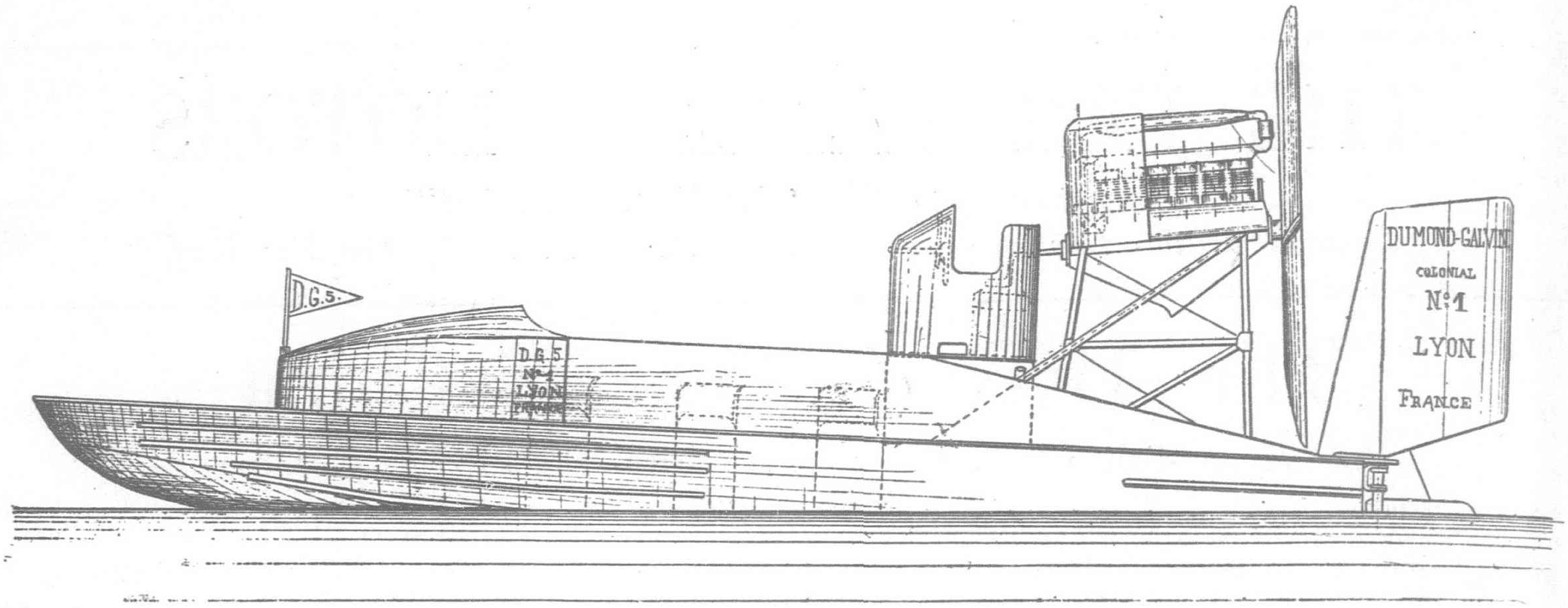
Its corresponds in its class to a large sized motor car, giving the same cost per mile for example.

Provided with a sturdy motor, using crude oil with a very low consumption its non-stop working is certainly more sure than in the case of a motor car, as its mechanism is less complicated and there is less of it and nothing has been sacrificed in its construction to lightness or speed to the detriment of its strength and suitability for commercial uses.

The D. R. type of commercial hydro-glider is fitted with an aerial propeller. Hull of the sea-going model two sheetings of mahogany-bottom copper sheeted to prevent erosion in sandy waters.

Divided into six water-tight compartments, in addition carries four air tanks sufficient to keep the boat afloat in any case.

| | |
|---|---|
| Length between perpendiculars .. .. | 30′ 8″ |
| Breadth .. .. .. .. .. .. | 9′ 11″ |
| Carrying capacity (deadweight) .. .. | 1.3 ton |
| Draft, loaded (stopped) .. .. .. | 7″ 3/16 |
| Draft at full speed .. .. .. .. | practically nil |



Colonial Model No. 1 of the Dumont-Galvin Hydro-Glider

Crew accommodation two seats, one for the pilot, who is at the same time the mechanic, one for a sailor boy.

Passengers accommodation :

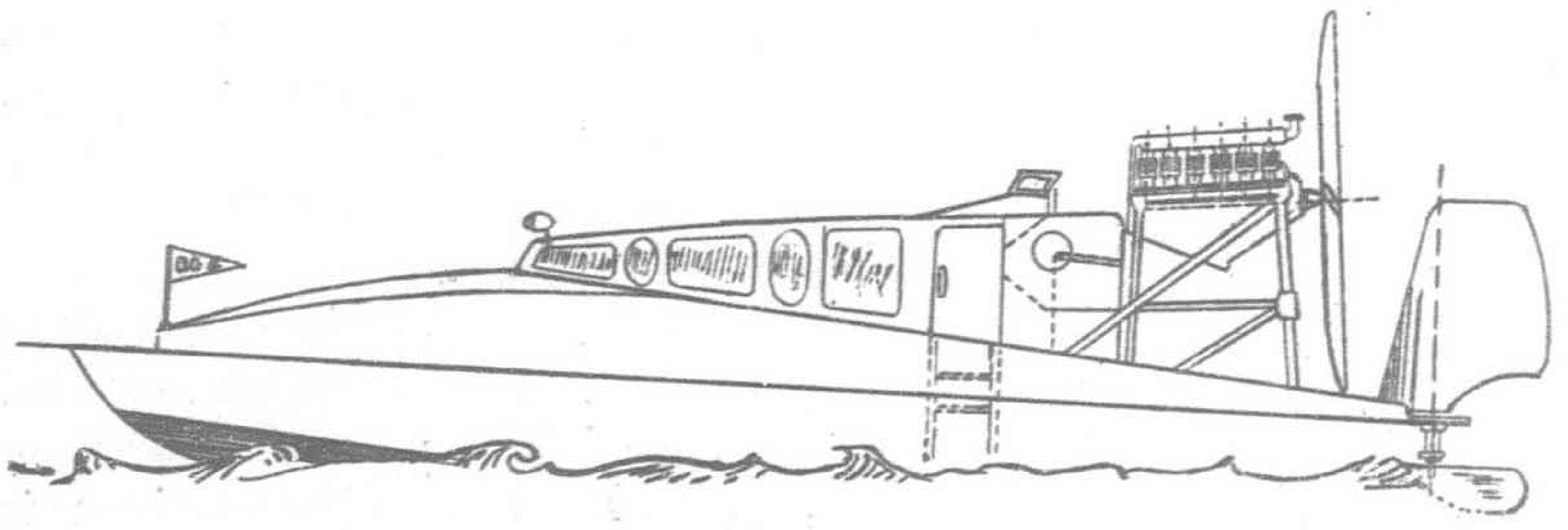
Open cockpit covered by collapsible awning with seats for ten passengers or closed cabin with seats for eight passengers.

Weight, empty .. .. .. .. .. 2,400-lb.

The closed cabin makes an extra-weight of 330-lb. Motor 6 cylinders in line (low compression and low rate of revolution).

The boat is fitted with an aerial rudder and will at full speed turn within a circle of not more than 130-ft. In addition a water rudder (taken outside the water at full speed) is used for steering at slow speed.

The motor is of industrial type and is more reliable than a motor-car engine because of the low compression (50-lb. per square feet) and the low rate of revolution (600 R.P.M.). It does not require any specialist and can be easily put in the hands of a Chinese mechanic.



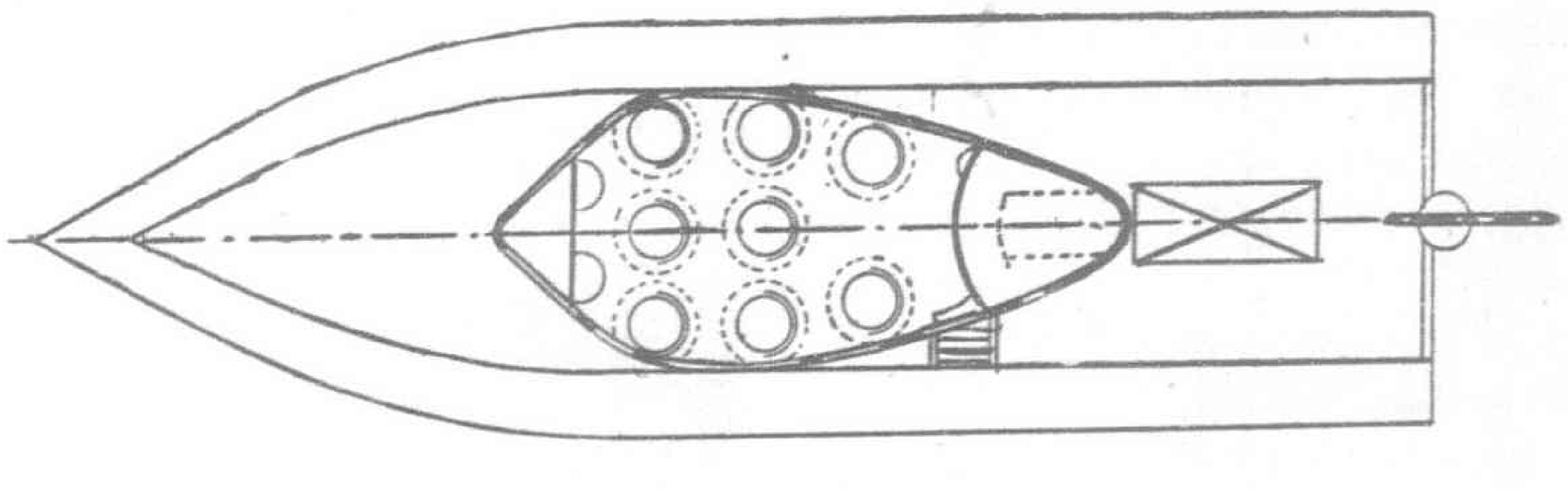
Closed Colonial Model

Propeller four-bladed or two-bladed large pitch directly coupled to the motor shaft.

| | |
|---|---|
| Full power | 100 H.P. |
| Mean power requested | 70 H.P. |
| Necessary speed to alight from water | 18.6. st. Miles per h. |
| Commercial speed | 28 st. Miles per h. |
| Full speed (momentary) | 37 st. Miles per h. |

Capacity of fuel tank sufficient for 11 hours.

| | |
|---|---|
| Kerosen consumption | 7 Imperial G.p.H. |
| Lubrication oil | 1/4 Imperial G.p.H. |



Seating Plan of Closed Model

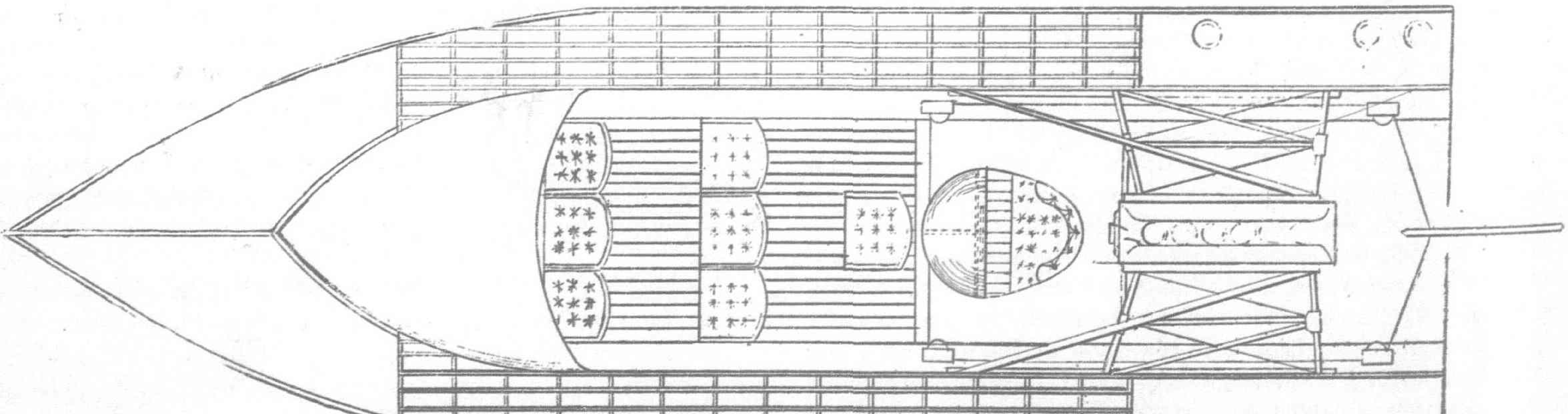
It works for several thousand hours without repairs. It is fitted with two carburettors, double sparking plugs and magnetos. Starting magneto and starting handle.

It starts easily by hand.

It burns Kerosen—a great advantage in China and the fuel consumption is garanteed not to exceed 7 gallons per hour.

This craft is quite different of the others made specially for speed in perfectly calm waters.

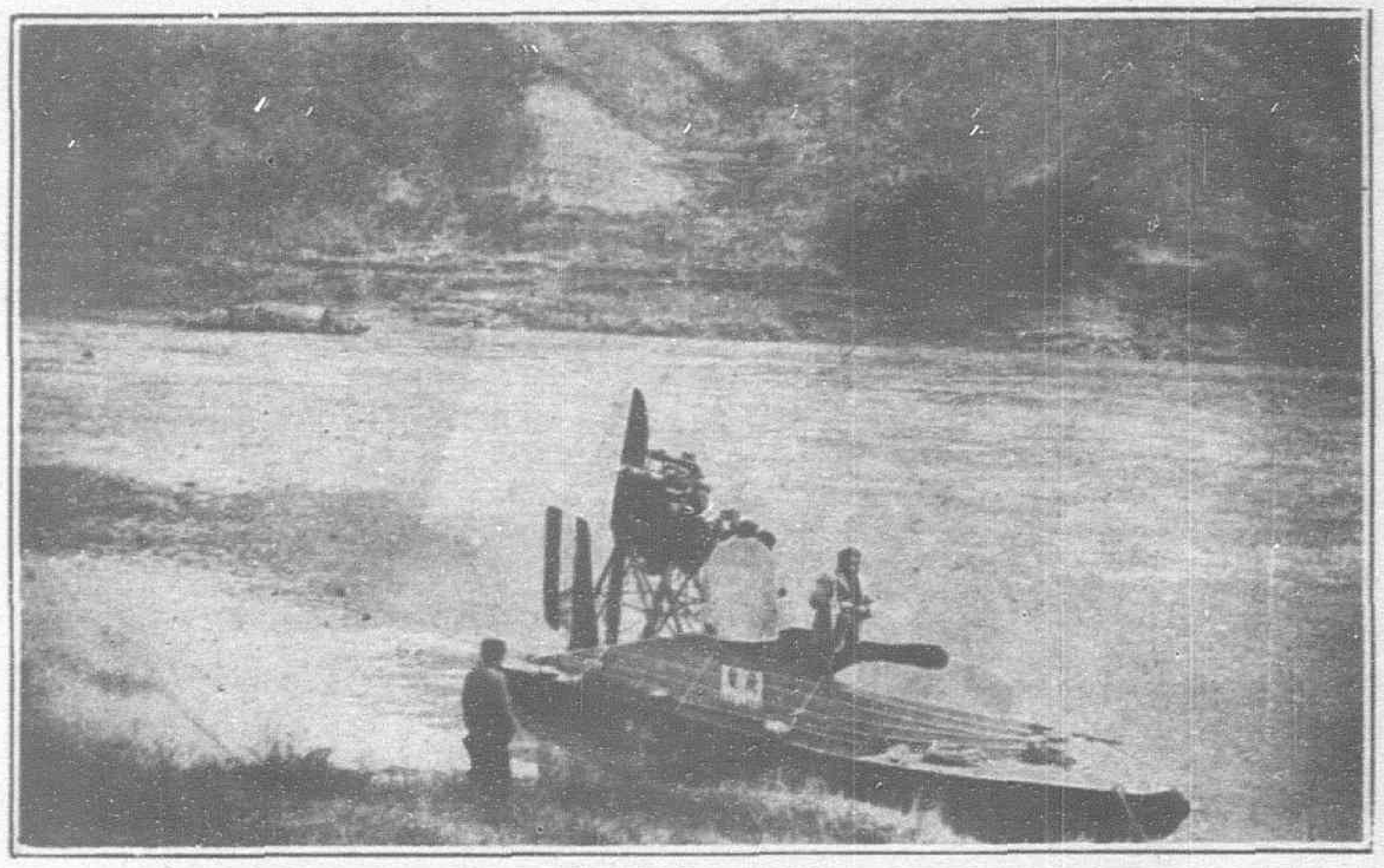
The hull is built on the lines and has the sea worthiness of a sea boat and is quite safe in strong eddies.



Seating Plan of Colonial Model No. 1

It will be perhaps of interest to add that the fact of the machine gliding on the surface of the water does away with the wake formed by a steam or a motor launch although much slower.

A demonstration trip was recently made at the request of Gen. Lu Yung-chang, tuchun of Chekiang, on the Tien-tang River in that province. This river along which is located several important towns, is the main artery of commerce and communication between the southern parts of Chekiang the eastern part of Anhwei and the provincial capital at Hangchow. Steam launches, even the smallest, are unable to proceed further than Tung-lu about 60 miles from Hangchow. Beyond this point, the difficulties begin. The river widens, narrows, shoals and is filled with sand bars, boulders and reefs, with many dangerous rapids. Junks are towed up the river, and at times the coolies have to pull them by main force over the sand bars. Under these conditions, the so-called "express" passenger junks, require at least six days to make the trip from Zakhou, Hangchow, to Chuchowfu and fifteen days to Tungchi, in Anhwei.



The Fei-Long in the Tilung Tang River Gorges

At the trial trip of the Dumont-Galvin glider, notice was served on the Chinese that it would leave Hangchow in the morning and reach Chuchowfu in the evening of the same day. The notice was received with loud laughter.

On the 12th of February fully loaded with 6 passengers, 80 extra gallons of fuel, in addition to the 80 gallons in the tank, with implements, spare parts, food, etc., the whole weighing about 3,000-lb., the glider started on its trip in a storm of rain and hail. The trip was without incident, leaving at the fixed time and arriving on schedule. We give here the log kept by Mr. B. Hemingway of the Asiatic Patroleum Co., who acted as guide and interpreter.

### OFFICIAL LOG OF THE HYDRO-GLIDER "FEI-LONG"

12/2/1922.

Zakhou to Chuchowfu via Tung-lu.

7.08 a.m. Left Zakhou.
8.29 ,, Passed Fuyang (90 *li*).
8.42 ,, Stopped for minor engine trouble (dirt in carburettor).
8.47 ,, Resumed voyage.
9.04 ,, Stopped. Dirt in carburettor.
9.14 ,, Resumed voyage.
10.07 ,, Passed Tung-lu (180 *li*).
11.47 ,, Passed Yenchow (270 *li*)
12 noon Stopped to oil engine and for lunch.
12.20 p.m. Resumed voyage.
1.52 ,, Passed Lan-chi (360 *li*)
3.20 ,, Arrived Lung Yu (450 *li*) stopped to pass through pontoon bridge.
3.29 ,, Resumed voyage.
4.55 ,, Arrived Chuchowfu (540 *li*).

Actual time under way, Zakhou to Chuchowfu 9 hours 3 minutes.

14/2/1922.

Chuchowfu to Zakhou, via Tung-lu.

7.30 a.m. Left Chuchowfu. (Heavy rain and strong wind)
9.00 ,, Arrived Lung Yu. Stopped to pass through bridge.
9.05 ,, Resumed voyage.
9.48 ,, Stopped to tighten loose bolt in engine.
9.52 ,, Resumed voyage.
10.30 ,, Passed Lan-chi.
12.09 p.m. Passed Yenchow.
1.52 ,, Arrived Tung-lu. Stopped to take fuel.
2.15 ,, Resumed voyage.
3 ,, Stopped dirt in carburetter.
3.05 ,, Resumed voyage.
3.53 p.m. Passed Fuyang.
5.18 ,, Arrived Zakhou. (Strong head wind between Yenchow and Zakhou. Rough water. Boat behaved beautifully.)

Actual time under way, Chuchow to Zakhou, 9 hours 11 minutes.

*Signed :* B. HEMINGWAY, Inspector of the
Asiatic Petroleum Co.

The only trouble experienced and which could have been easily avoided by taking along a funnel with a filter to fill the tank, and so provided against dirt in carburettors.

The obstacles to an ordinary boat did not exist for the glider. With a draft of less than 1-in., the shallow places did not impede progress and as for rapids, it is impossible to note them.

Making no wash the glider did not disturb, the small craft and as for steering, it is as simple as the driving of a motor car. The glider passed at full speed between native boats and climbed several V shaped rapids without difficulties. The experience gained on this trip enabled the owners to accurately calculate the cost price per ton per mile for freight.

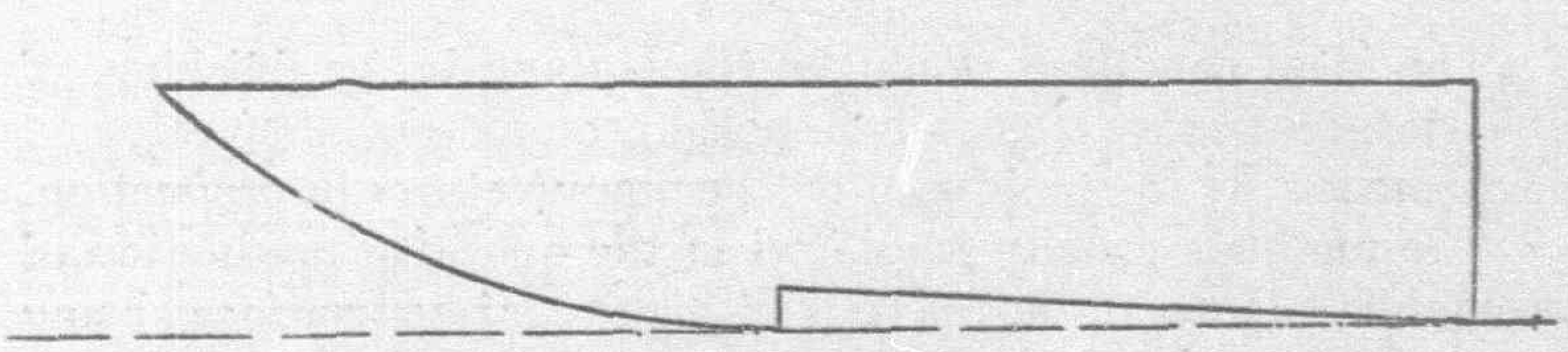
Including every expense: capital, interest, depreciation, repairs, upkeep, insurance, etc., wages of the crew (two men), fuel and lubricating oil, on one side, and on the other side: the efficiency of the boat, weight carried, speed, and hours of utilization, the cost was figured out at Mex. $0.70 per ton mile, or about Mex. $0.07 cents per passenger with luggage per mile.

This price although high, is not prohibitive. It is a little above the cost of transportation by motor car, but much below the cost of transportation by aeroplane. It is out of question to carry coolies in gliders, or to compete with railways or steam boats, but when there is only junks or sampans, the glider is the most economical for the business man with whom time is precious. The price for junk hire is small, this must be added the taels and fatigues of such a trip.

More economical than the aeroplane the glider is much safer, and cannot sink. It is sure to remain afloat. It is easy to steer. Sturdier than the aeroplane, the glider will last a longer time. Its weak point was formerly its aviation engine, too light, too complicated. The substitution of this engine by an industrial type of motor has eleminated this.

Wherever the glider is placed in service, no sheds, no landing places, no roads, or slips are required. The glider can start and stop where it pleases.

It would seem that with its advantages the entrance of the hydro-glider as a means of inland-water transportation, would be welcomed by the authorities. It seems somewhat tragic, however, to learn that the customs officials have refused to grant navigation licenses to these boats, because the treaties do not provide for hydro-gliders navigating inland waters! The demonstrations have, however, interested the Chinese, and by the end of this year regular services of gliders will exist on several rivers, with the certainty that the traffic will increase from year to year.



Showing the "Step" of the Hydro-Glider

# Lubrication Its Relation to Engine Wear

## Prepared by the Engineering Division of the Vacuum Oil Company

THE erroneous impression has existed for quite some time that after an engine has seen considerable service, the wear produced by such service on the metallic surfaces necessitates the use of oils heavier in body than were originally suitable. Further, that the progress of wear and need for heavier oils may be predicted for all cars on a definite mileage basis.

If we apply the acid test of scientific engineering analysis to this practice, we find that it is based entirely on the following :—

*Fallacious Assumption—No.* 1

That wear takes place at substantially the same rate in all makes and types of engines under all conditions of service.

This assumption neglects entirely the fact that there are wide variations in the materials used for cylinders, pistons and piston rings in different makes of cars ; differences in design and proportions ; differences in manufacturing processes. It also assumes that all owners will accord their cars the same care.

It must be evident that variations in any of these factors will largely affect the rate with which wear will take place and consequently will make the mileage basis for determining the proper lubricant very inaccurate.

It is well known that the rate of wear of aluminium and cast iron pistons varies widely and that the care exercised in " seasoning " and finishing cylinders and pistons materially affects the life of these parts. Some owners will take no care whatever of their engines and may drive at high speeds. Others will give proper attention to lubrication and drive their cars with care.

For these reasons it must be plainly evident that any system attempting to determine the proper lubricant for all cars on a fixed mileage basis alone must yield results which are wholly inconsistent and not to be relied upon.

*Fallacious Assumption—No.* 2

That from the time the engine is new, wear is uniformly progressive in proportion to the mileage of the vehicle.

When engines are new, the metallic surfaces in contact with one another are only as smooth as is permitted by the method or methods employed in the finishing of such surfaces.

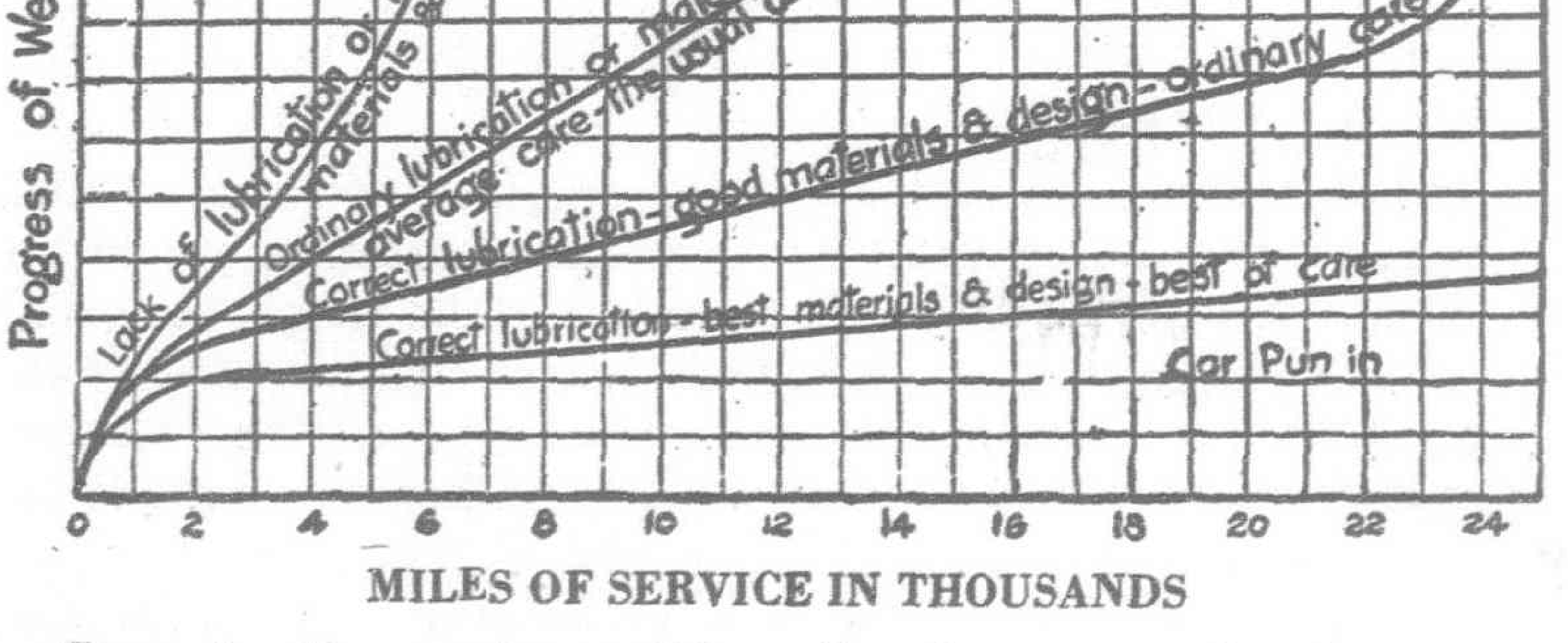


**Figure 1.—*How varying conditions affect the progress of engine wear***

The ideal condition would be the lapping in, or finishing, of these surfaces to give them a high polish, completely eliminating all roughness left by the tools used by the manufacturer in production.

The methods usually employed in the quantity production of automobile engines do not permit of highly finished surfaces being secured. Likewise, the time required for producing such highly polished and finished surfaces would necessitate high cost in production and eventually mean higher cost to the purchaser of the car.

Examination by engineering experts of new cars of many different makes has conclusively proven that the engines, when turned out by the manufacturer, are run in only to a limited degree ; consequently, when the car is received by the purchaser, the metallic surfaces are still somewhat rough.

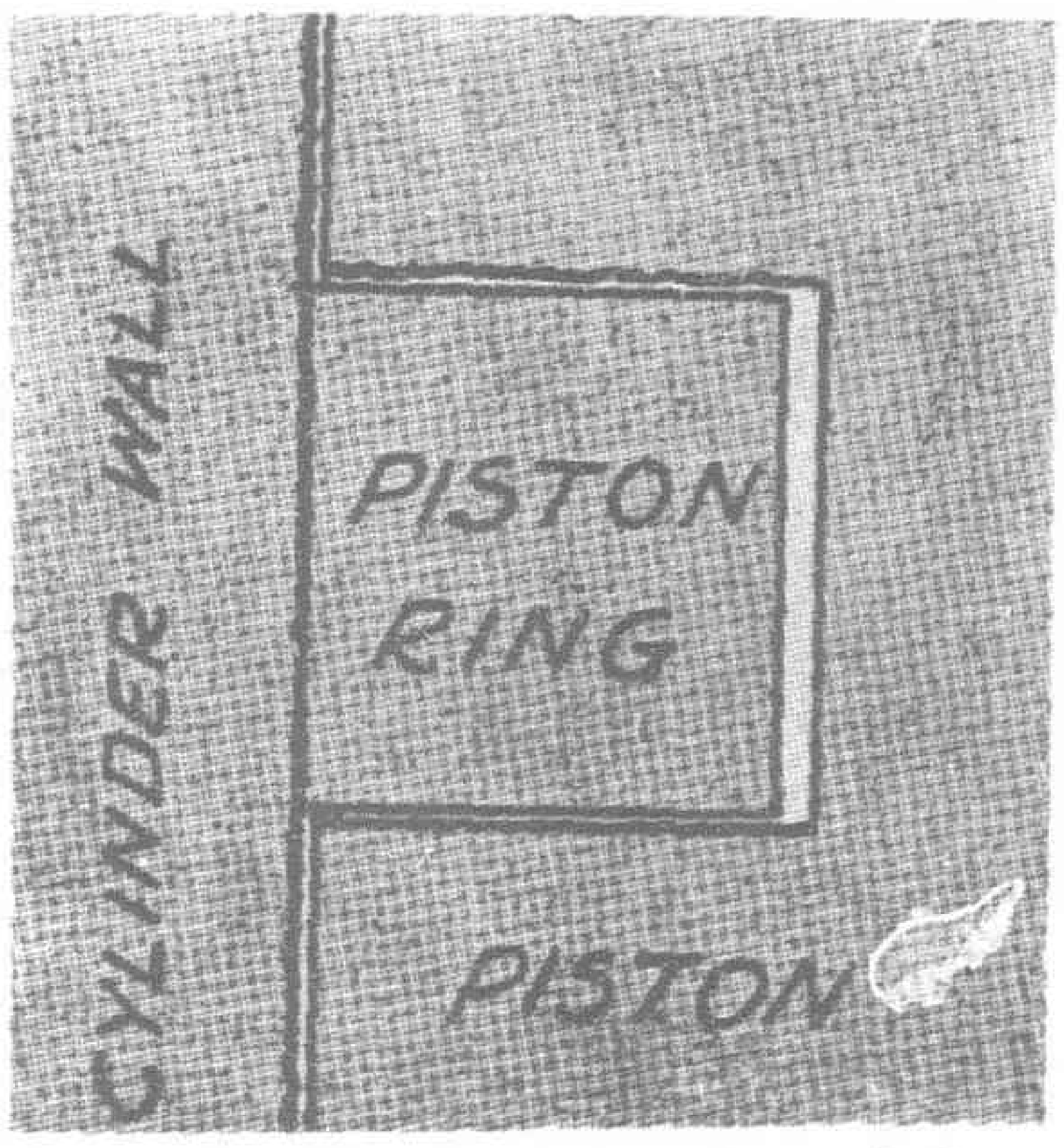


**Figure 2.—Emphasizing the roughened condition of cylinder, piston and piston ring surfaces found in new engines.**

Because of this it is necessary for the purchaser of the car to operate his engine at moderate speeds and loads for at least 1,000 miles before the rubbing surfaces wear to produce running fits. During this period, however, it is not necessary to use a lighter oil than is correct for the car when run in.

As the parts wear in, there is a slight but nevertheless marked increase in the clearances to the running fits required as indicated in Figure 1 by the first part of the curves. The change in the condition of the surfaces is illustrated in Figures 2, 3 and 4.

Once these polished bearing surfaces and running clearances are produced as a result of engine use, very little wear will occur for many thousands of miles thereafter, if proper lubrication is provided. It must, therefore, be true that if wear takes place to any appreciable extent, such wear is directly due to poor lubricating value of the oil used or in rare instances, to poor design or materials.

When wear has progressed to such an extent that the piston rings possess perceptible up and down movement, the pounding action of the rings on the sides of their grooves tends to increase the enlargement at a very rapid rate. This is the point at which trouble from oil pumping usually commences and the condition existing is represented in Figure 5. Under this condition the clearances have become so large that no oil, regardless of body or character, will prevent oil pumping or overcome blow-by.

To summarize the progress of wear we have, first, the running-in period during which wear is slight but rapid ; next, the period in which the rate of wear is very gradual and dependent upon the degree to which the engine is correctly and efficiently lubricated ; finally, the continued and accumulating wear causes pounding of the rings in their grooves and oil consumption rapidly increases. Excessive wear should be cut short and corrected mechanically by repairs or replacements of the worn parts.

*Fallacious Assumption—No.* 3

That piston clearances and piston ring fits alone determine the choice of the proper oil.

While it is absolutely necessary that the correct oil be one of ample body and proper character to seal the piston rings against gas leakage under all operating conditions, there are three other equally important factors which must be considered in selecting the correct oil for any automotive engine.

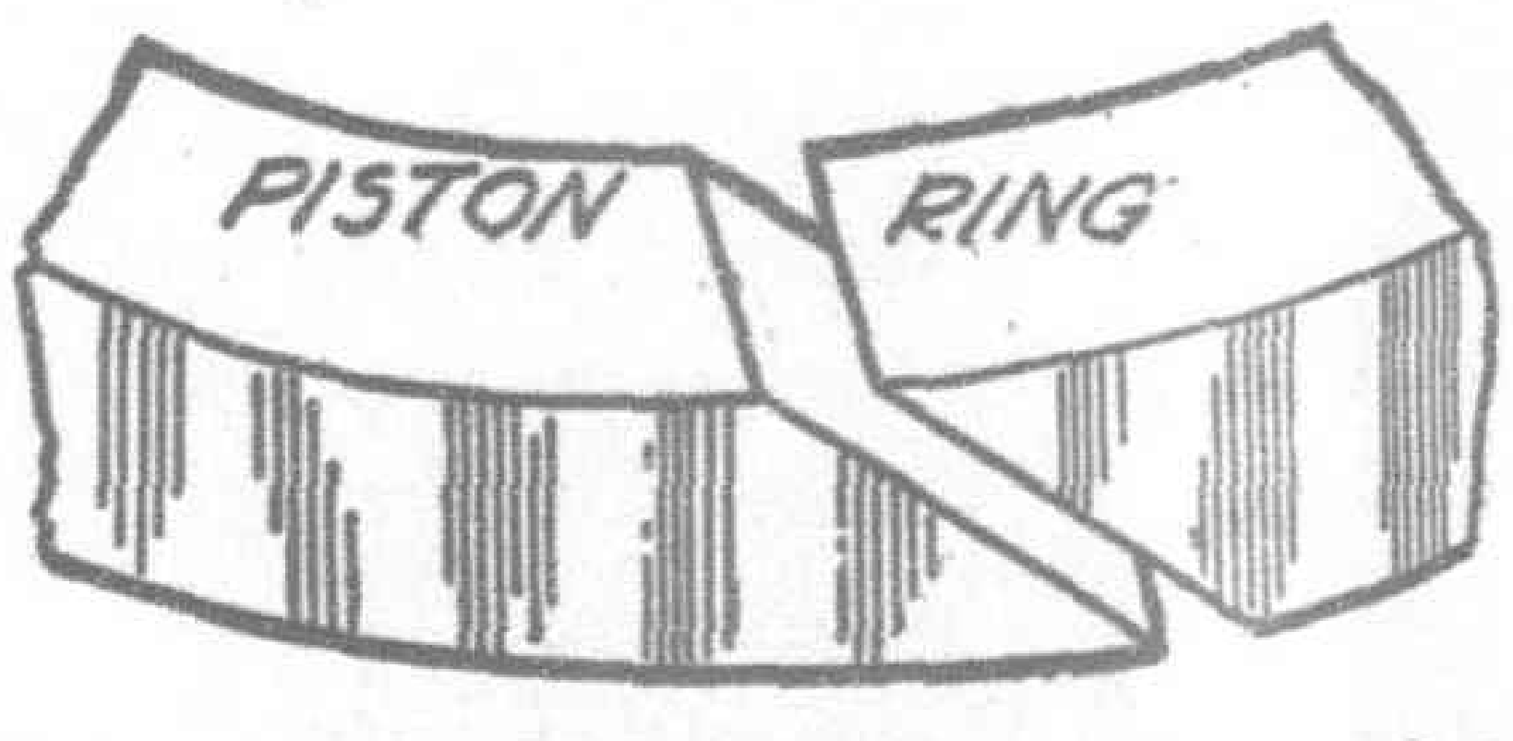


**Figure 3.—How running the engine starts the lapping-in process which results in close contact between the piston ring and the cylinder wall.**

The first is the operating temperature. This is influenced by the type of service, the type of cooling system employed, the cylinder dimensions, valve arrangement and by the details of design.

Second is the ability of the lubricating system to handle oils of different bodies.

It is well known that certain types of systems will lend themselves better to the distribution of light-bodied oils, while others work best with oils of medium or heavy body. It is also true that in some cases, due to details of the lubricating system, the employment of heavy-bodied oils may prove disastrous, due to lack of distribution of the oil under some operating conditions.

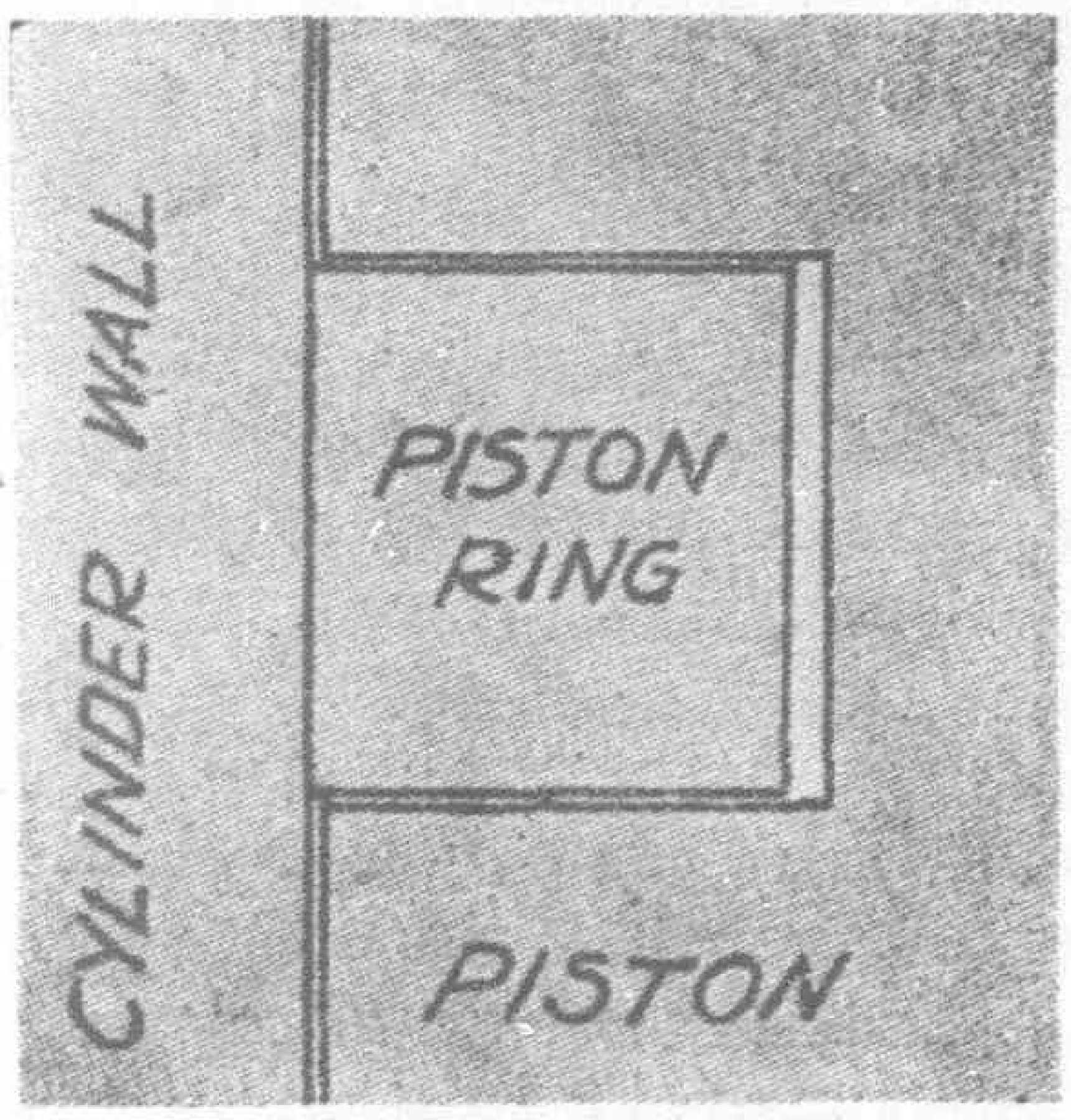


**Figure 4.—Illustrating the smoothness of the friction surfaces in the fully run-in engine.**

The third factor is carbon deposit. Due to characteristics of design, some engines will not burn cleanly oils of heavy body. The result is excessive carbon deposit which does not form when lighter oils are used. This condition is aggravated when heavier oils are used to overcome wear.

In other words, there are three very important factors which, in addition to piston and piston ring clearances, affect the selection of the correct oil and which may render inadvisable the use of oils of heavy body.

### *Fallacious Assumption—No. 4*

That the use of a heavy-bodied oil in engines that have worn excessively will overcome oil pumping.

Oil pumping is the term usually applied when an engine is using large quantities of oil. In many cases it results in spark plug fouling and almost invariably in carbon deposits.

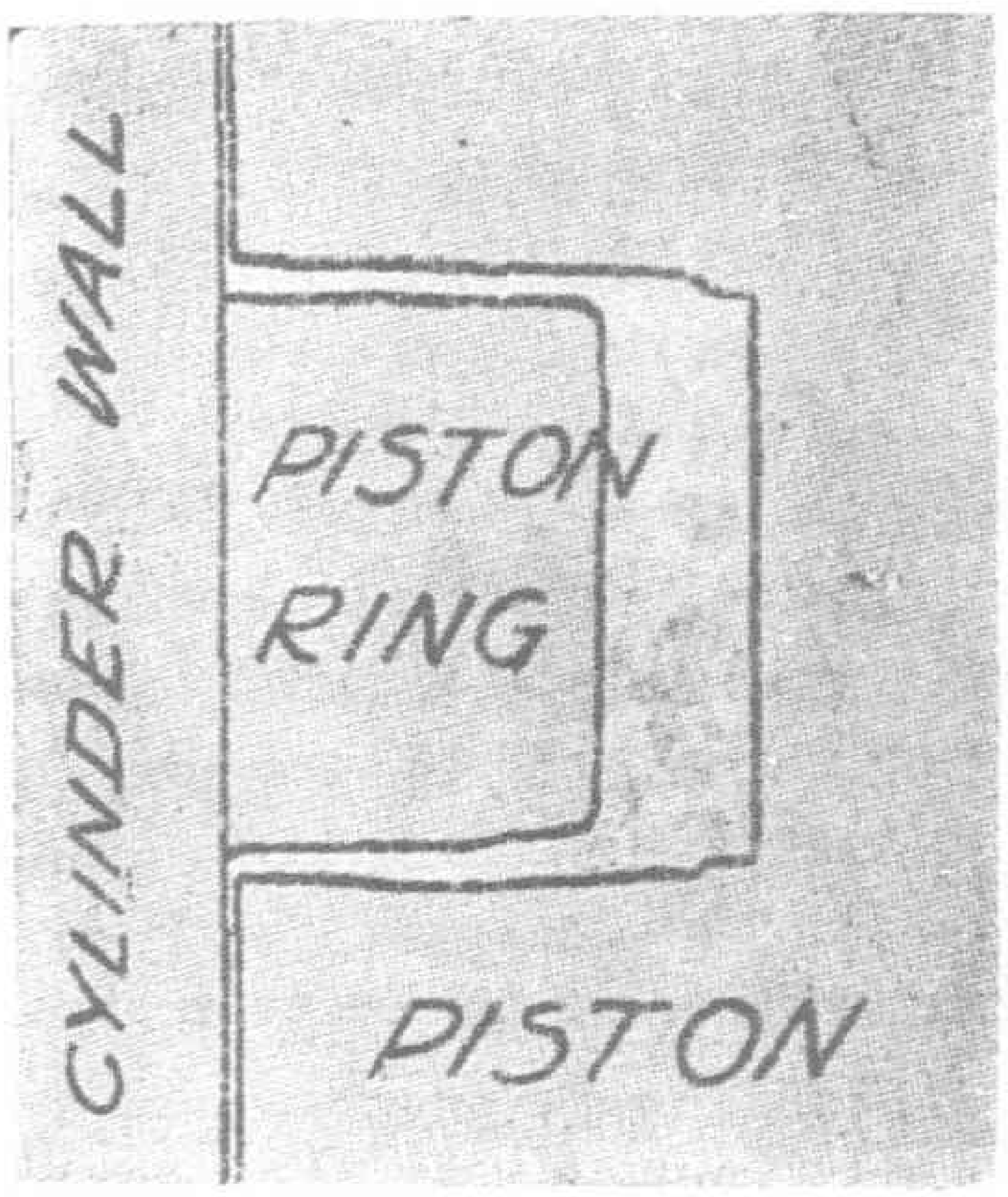


**Figure 5.—When ring pounding sets in piston ring slot clearances enlarge to such an extent that no oil will seat the piston rings.**

When oil pumping occurs in cars which have previously worked satisfactorily, heavier-bodied oils are often employed to reduce it.

It is a fact that heavier-bodied oils are usually consumed more slowly than light bodied oils but this remains true regardless of the condition of wear. Hence, if a change is made to a heavier oil in a worn engine this oil will also be consumed in proportionately excessive amounts.

Consequently, when such oils work into the combustion chambers in excessive amounts they are not completely burned but remain to form large quantities of carbon.

Therefore, if the engine design were such that a heavy-bodied oil could not be used when the engine was in good condition, due to excessive carbon deposit, this oil would be still more unsatisfactory when wear permitted it to pass the pistons in excess.

Any other factors of design making unsuitable the use of a heavy oil in a new car would continue to exist regardless of wear and render its use inadvisable.

We find that the determination of suitable lubricants for automobile or motor truck engines on an arbitrary mileage basis is unsound because:

1. *Rate of wear is not constant for all engines.* It varies with the design, material, manufacturing finish and the care given them in service. It is chiefly controlled by the value of the lubricants used.

2. *Wear is not measurable in terms of mileage operation.* The manufacturing finish is an initial variation especially in quantity production and all cars are subjected to a wide difference in care on the part of operators. The selection of the correct oil will minimize wear not affected by mechanical imperfection in design, manufacture and operation.

3. *Variation in piston clearance and piston ring fits are not the only determining factors in the choice of proper oils.* Operating temperatures, oil distribution, and the character of the oil as affecting carbon formation, are of equal importance.

4. *No oil, regardless of body, can seal excessively worn piston rings against oil pumping.* The recommendation of a heavier grade of oil after a short period of engine service is an admission that the oil originally recommended was incorrect.

### Summary

The correct oil is the one which meets the conditions of operating temperatures and oil distribution; which provides a proper piston ring seal and in service leaves a minimum of carbon deposit. By its use, wear is greatly minimized. Such an oil will be of a character to provide efficient lubrication, under all operation conditions, throughout the life of the car. When accumulated wear becomes excessive proper repairs alone will overcome its effects.

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## Motor Vehicles in China

Recent statistics show motor cars to the value of over three and a half million Haikwan taels were imported into China in 1920, as compared with 1,272,981 and 2,158,998 Haikwan taels for the years 1918 and 1919 respectively.

The bulk of these cars came from America, but British cars are being seen in increasing numbers in the streets of Shanghai and other large towns. Unfortunately the cheapest British cars that come to China are far more costly than American cars of similar model and power, and unless some drastic reduction in the price of British cars can be effected it is impossible for them to hope to be able to compete successfully in Chinese markets. It should further be borne in mind that as yet there are few really good roads in China, cars being used principally for town work, and there is no doubt that for crowded traffic and narrow streets with sharp turnings the low-geared American car is far more suitable than the high-geared British car.

It is satisfactory, however, to note the British motor car manufactures have begun to realize the possibilities of the China market and that several leading manufacturers have recently concluded agency agreements with local garages. Motor trucks and lorries are coming into general use for transport purposes, and there would appear to be a great future for this class of vehicle in China.

## New American Steam-Driven Motor Cycle

From time to time, experimental steam-driven motor cycles have made their appearance, and so the use of steam as a method of propulsion is by no means new. It is interesting to note therefore that an American, named Longford, has produced a "gearless, beltless, chainless and noiseless steam-driven motor cycle," which is expected to sell at a lower price than that of the average petrol-driven machine.

The machine runs on kerosene, which generates the steam, and a consumption of 45 m.p.g. of kerosene and 55 m.p.g. of water is said to have been obtained. The boiler of the machine is of the semi-flush type. There are two 2½-in. by 3-in. cylinders attached one on each side of the rear wheel, giving a direct pull without any loss of power. The engine is capable of developing 300 r.p.m., and 2,000-lb. pressure can be applied to the rear axle crankpin by opening the throttle to its fullest extent.

# Good Roads in China Affect all Countries

THERE is to-day not a nation in the world with any commercial or industrial development worthy the name, that is not vitally interested in China. This is because of the 400,000,000 Chinese people, who form a potential market of tremendous purchasing power for all manner of goods.

Practically the only market in China of immediate value to the foreign exporter is in the large coast cities, Peking, Hongkong, Shanghai, Canton, etc. The development of the interior has been retarded by the lack of means of transportation and communication. Without good roads, permitting commercial intercourse between the coast and the interior, the century-old ideas and idiosyncrasies of the Chinese cannot be overcome.

Good roads are therefore a fundamental and primary requisite for the economic development of China. This has been poignantly brought to the attention of the civilized world during the famine of the last year. In many instances food rotted at railway terminals, while at a distance of 50 to 100 miles hundreds and even thousands of people starved, because there were no means of transporting the food to them, and no roads. The afflicted region, with a population of 45,000,000, is impenetrable to all except the most primitive forms of cart and wheel-barrow transportation.

The American Red Cross is engaged in the construction of roads to make use of the famine labor in the stricken territory. One of these roads, in the province of Shantung, will be nearly 100 miles in length. At present the total mileage of metalled roads in China does not exceed that figure.

Natural conditions in China are favorable to the building of roads. There are no torrential rains to wash away the subgrade and undermine foundations; and there are no long periods of frost except in the extreme north. Furthermore, the materials necessary for road building are available in the country itself.

There are two chief obstacles in the way of road building in China—national poverty, partly real, partly due to corrupt officials; and that individualistic trait in the Chinese character, strengthened by the keen competition for existence, which prevents co-operative effort to further movements for the common welfare.

There is, however, encouragement in the fact that the past two years have witnessed the beginnings of what will some day be a national movement for good roads. The first important road in China was built by the American Red Cross several years ago, from Peking to Tungchow, to relieve the victims of a flood in North China. As a direct result of this work sporadic road building projects have sprung up, notably in the Tientsin and Shanghai districts. Other projects of a similar nature are in contemplation.

The merchants are the most progressive element in China and the hope of good roads lies largely in their hands. Fortunately, they are beginning to display considerable interest in the matter, and this interest must be encouraged by foreign manufacturers, especially manufacturers of motor cars and trucks.

Public opinion is perhaps a more potent force in China than in any country in the world. For that reason, the education of public opinion to the value of good highways is essential. The greater the number of Chinese who own motor cars and trucks, the greater will be the demand for roads.

Nothing can be expected at the present time from the Chinese government at Peking, on account of the instability and poverty of that organization. The suggestion that foreign manufacturers, especially motor car manufacturers, make loans to the Chinese government for the purpose of road building is not feasible for the reason that the control of the central government over the various provinces is not well enough defined, and the result would probably be a waste of the funds thus made available.

Under the consortium of foreign powers great progress in the building of national highways should be made. Herein lies the greatest immediate hope of such projects. Public opinion, built up and made active through the extensive use of motor vehicles, should insure the continuation of road building by the Chinese government, once the latter is firmly established.

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

**Practically back to Pre-War Prices**

| Type | To-day's Price | Price Jan., 1921 | Reduction |
|---|---|---|---|
| 2-2½-ton Standard Lorry Chassis... | **£730** | £ 997 | *£267* |
| 2-2½-ton Long Char-a-bane Chassis | **£750** | £1,007 | *£257* |
| 3½-4-ton Lorry Chassis ... ... | **£865** | £1,195 | *£330* |
| 3½-4-ton Char-a-bane Chassis ... | **£880** | £1,190 | *£310* |
| 4-ton Long Wheelbase Omnibus Chassis ... ... ... | **£950** | £1,200 | *£350* |
| 5-6-ton Lorry Chassis ... ... | **£960** | £1,320 | *£370* |

**The prices given above are F.O.B. Guildford, England**

WITH a view to stimulating trade and maintaining employment, we have written down our Stocks to a figure very much under cost, and this, with the wages reductions that will take place in the near future, has enabled us to sell our Chassis as from October 1st at the prices mentioned opposite.

Purchasers of "DENNIS" vehicles, even at such low prices, can feel perfectly assured that they are acquiring absolutely new goods of latest and most improved construction, as Dennis Brothers have never purchased or taken back second-hand War Lorries. The Vehicles we are offering are absolutely new and embody improvements on previous models. We have been able to keep our factory busy on new productions, and are not selling Chassis made two to six years ago and re-purchased from the Government, nor are we offering re-conditioned War Chassis.

WRITE FOR PARTICULARS:—

*Agents:*

**Messrs. Wearne Brothers, Ltd., 310 Orchard Road, Singapore.**
**Messrs. Perrin Cooper & Co., Consular Road, Tientsin.**
**Messrs. Central Garage Co., 9 Hongkong Road, Shanghai.**
**Messrs. Alex Ross & Co., Ltd., Machinery Department, Hongkong.**
**Messrs. Fikkert Motor Car Co., Weltevreden, Batavia.**

**Cables: A.B.C. 5th Edition,**
**Lieber's, Bentley's, Marconi.**

**DENNIS BROS., LTD.**
GUILDFORD, ENGLAND

D 221

# The Gleniffer

MESSRS. Gleniffer Motors, Ltd., manufacture four-stroke marine motors of the paraffin type though they also build them to run on petrol only if desired. The engines which they are at present manufacturing have all been designed within the past two years. The aim of the designer has been to produce an engine which will be as far as possible fool-proof and require as little attention—and especially skilled attention—as possible. At the same time it should be able to run for extended periods without the necessity of an overhaul.

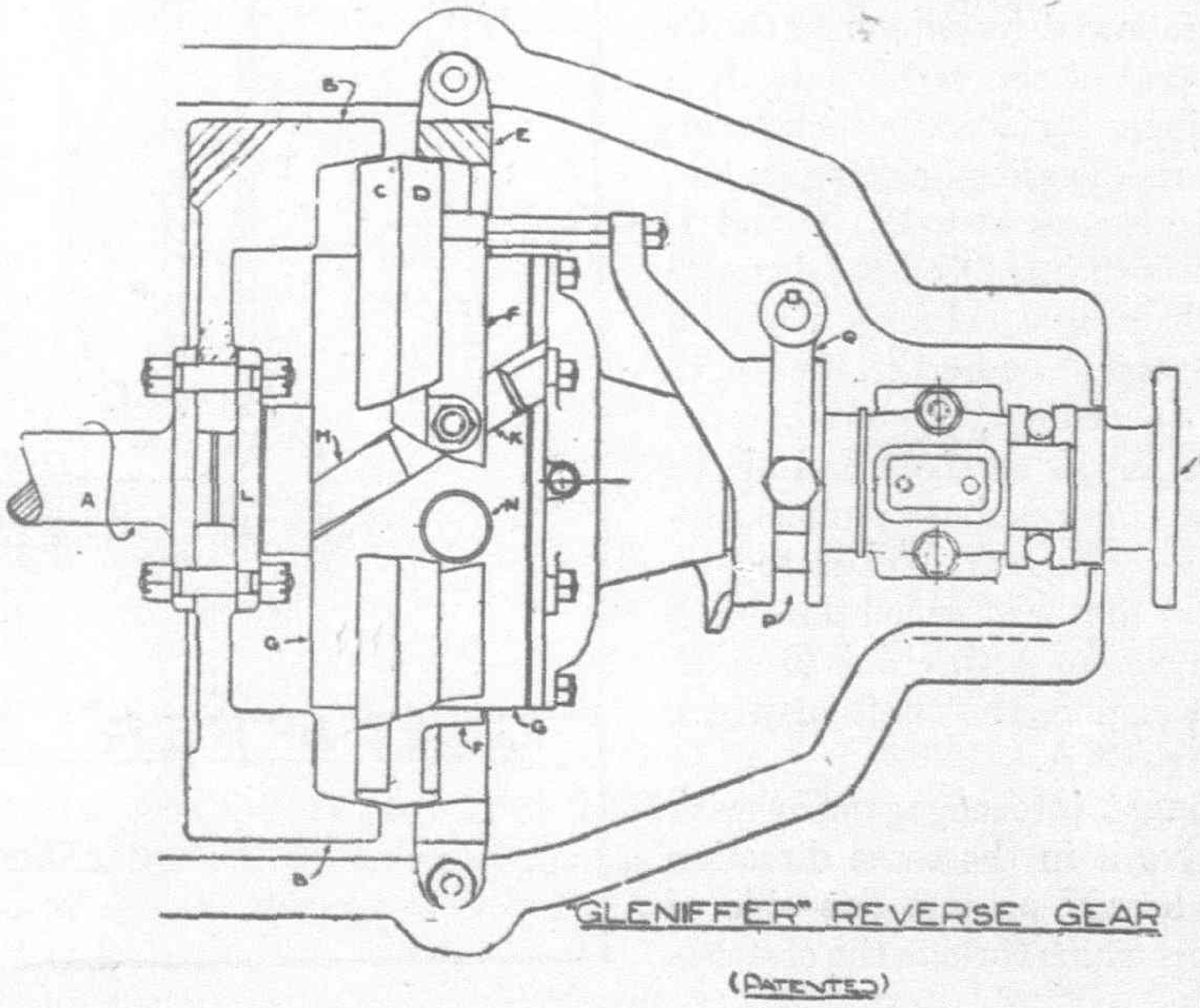
Two series of engines have been designed, one series having cylinders 4½-in. bore by 5-in. stroke and made in two, four and six-cylinder models, and the other series having cylinders 6-in. bore by 8-in stroke, made in one, two, four and six-cylinder models. The 4¼-in. by 5-in. paraffin engines develop 12, 24 and 36 B.H.P. and the petrol engines 14, 28 and 42 B.H.P. The 6-in. by 8-in. engines develop 12½, 25, 50 and 75 B.H.P. on paraffin and 15, 30, 60 and 90 B.H.P. on petrol. The normal speed of the 4¼-in. by 5-in. series is 800-1,000 R.P.M. and of the 6-in. by 8-in. series 600-700 R.P.M.

All corresponding parts in the different models of each series and made interchangeable, even such parts as the reverse gears, governors and water pumps (the strokes of which are altered by fitting different eccentries) are the same in all engines of the same series, and all the main bearings are alike and interchangeable with the big end bearings. By this means quantity production of all the smaller parts can be attained at the same time as offering a fairly large selection of models and thus also can the cost of production be lowered.

The line drawing shows the details of construction of the 24/28 H.P. four cylinder 4¼-in. by 5-in. engine and reverse gear, which shows the general design of the complete range of engines manufactured by the firm.

The cylinders except, of course, in the single-cylinder model, are cast in pairs, having detachable heads and inclined valves operated by rocking lever tappets with rollers running on the cams.

The compression joint on the head is made by a copper and asbestos gasket and the water joint by rubber rings. These rubber rings prevent the water coming in contact with the asbestos or copper of the gasket which thus overcomes the chief difficulties connected with detachable heads. It also facilitates the detaching of the head, which is done by merely disconnecting one outlet water connection and the holding down nuts. Inspection and cleaning doors are fitted on each end of the water jacket. The detachable cylinder head is so arranged that the piston and connecting rod may be removed for inspection through the top of the cylinder without moving the cylinder itself. The gudgeon pins are located in the pistons by a contracting spring steel ring in a groove round the piston. The connecting rods are of conventional design. The big-end bearings are die cast white metal bushes housed in steel keeps and are interchangeable with the main bearings which latter are mounted on the bottom half crank case.



"GLENIFFER" REVERSE GEAR

(PATENTED)

The reverse gear is incorporated in the fly-wheel at the after end of the engine and is entirely encased within the crank case, with the result that the outfit takes up very little space fore and aft, and gives a particularly clean appearance. A unique system of lubrication is employed, the oil being thrown by the fly-wheel from the sump into an oil-collecting chamber in which are placed small buckets which catch the oil; from there it is led by gravity through large bore copper pipes to cups above each main bearing. The overflow from these cups supplies the troughs in the bottom of the crank case from where it is splashed by dippers on the big ends to all the remaining working surfaces of the engine. The reverse gear, being in the after end of the crank case, is, of course, running in oil. This lubrication system is thus entirely automatic and fool-proof. In the larger sizes of engines the lower portion of the base chamber is water jacketted for its entire length thus keeping the lubricating oil at a moderate temperature.

In order to reduce the work entailed in running the engine and to reduce the chances of ill-usage all moving parts in the engine, with the exception of the water pump eccentric, are enclosed within the main crank case and are lubricated from the splash caused by the connecting rod dippers. The oil which works out along the pump driving spindle is fed into the eccentric, thus rendering the automatic lubrication complete.

It might be thought that a totally enclosed engine would be very inaccessible, but this is not the case in these engines. Exceptionally large doors are fitted on each side of the crank case which are amply large enough to enable spanners to be manipulated with ease, and also to examine, adjust or replace main or big end bearings. Large doors secured by finger-screws are likewise fitted to the chambers in which the valve spindles and rocking levers operate. From these chambers is drawn a proportion of the air which supplies the vaporizer. This maintains the circulation of oily air into these chambers and at the same time prevents all leakage of foul air from the crank case into the engine room.

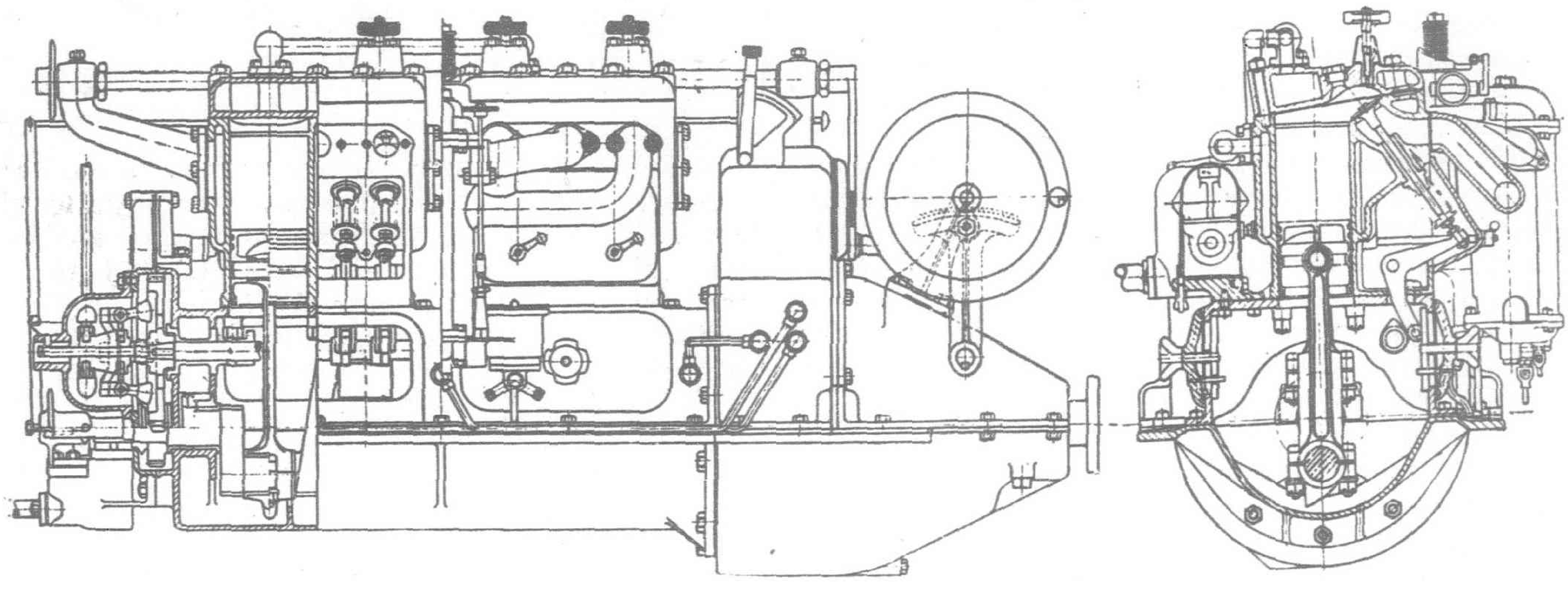
The paraffin vaporizer is of the exhaust heated type and is ingeniously arranged to make use of a physical property of the fuel which completely overcomes the difficulty of vaporization when running for prolonged periods at dead-slow speed.

The temperature at which paraffin can be completely vaporized is dependent to a considerable extent on the pressure at which the vaporization takes place. The lower the pressure is, the lower will be the temperature necessary to cause vaporization.

In a throttle-controlled engine running on no load or dead slow a partial vacuum is formed between the throttle and the cylinder. This reduction of pressure amounts to as much as 7 to 8-lb. per square inch when an engine is "ticking over" or in other words the pressure in the inlet pipe is about one-half the atmospheric pressure.

In order to take advantage of these properties of the fuel the throttle is so arranged in this vaporizer that the fuel is subjected to the above-mentioned partial vacuum throughout the period of its carburation and vaporization.

The arrangement of the parts of the vaporizer are as shown in the diagrammatic line drawing in which C is the throttle which controls the whole supply of air entering the system. Part of the air passes down the passage L where it is heated by contact with the wall of the exhaust heated chamber. It then passes up through the choke tube F drawing with it a supply of fuel from the jet G, and continues through the exhaust heated tube M, and so to the engine. An



automatic air valve D is fitted which is controlled by the spring A to which a tensioning device is fitted (not shown in the diagram). A dash pot B is also fitted to prevent violent movements of the valve. The valve H is used to control the flow of fuel from the float chamber through the passage K to the jet G. It is essential that the pressure on the fuel in the float chamber should be the same as the air before passing through the choke tube. For this reason the passage E is necessary.

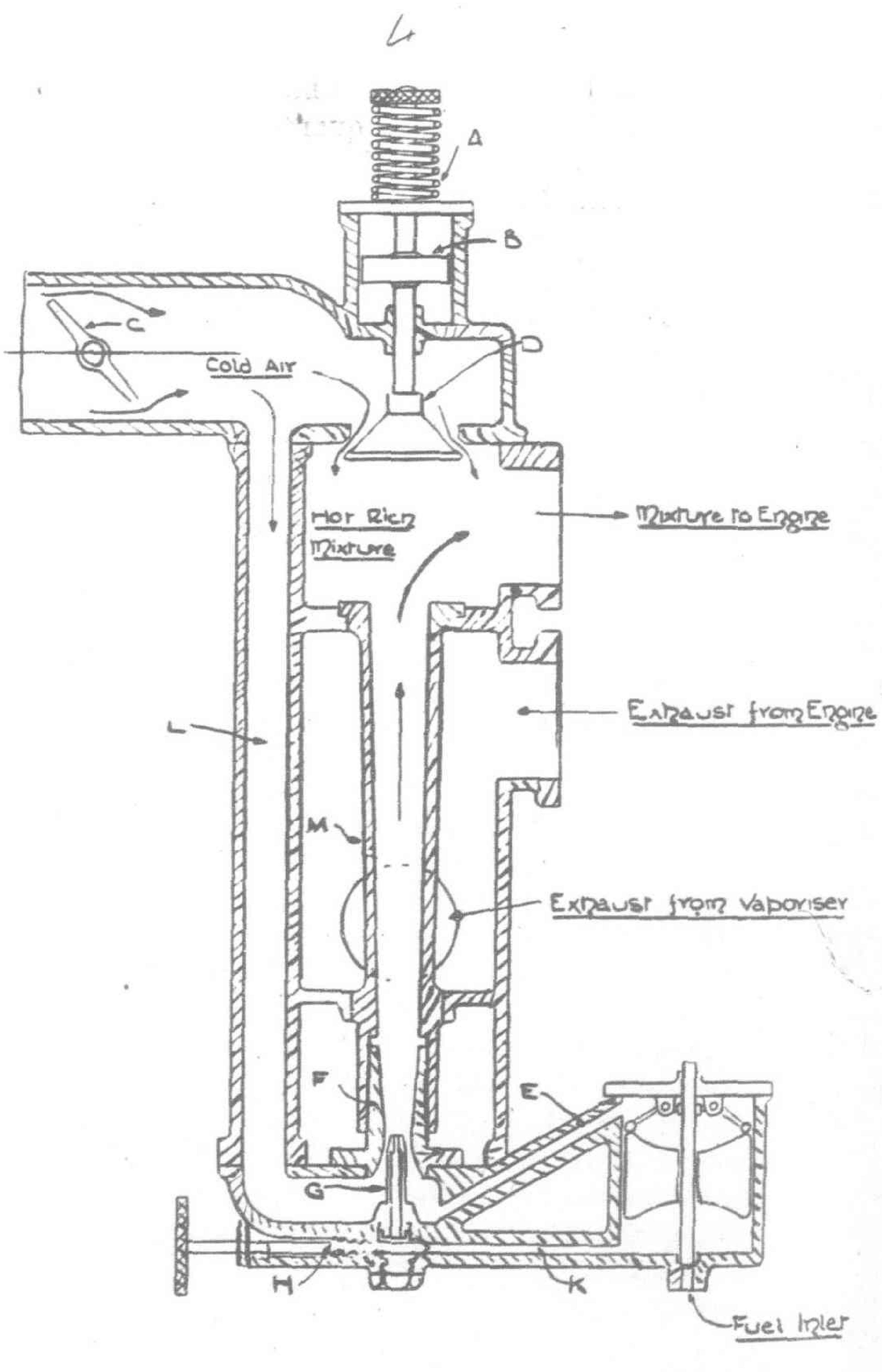
When the engine is running on full load only a small proportion of air passes down the passage L which forms an excessively rich mixture at the choke tube. This rich mixture is heated to a high temperature in the tube M which completely vaporizes the fuel. The mixture is then diluted to the correct strength by pure cold air from the valve D and passes to the engine at a moderate temperature. When running dead slow the valve D is closed automatically and all the air passes the choke tube where it draws only sufficient fuel from the jet to make a correct mixture, this passes through the heating chamber M which is now at a much lower temperature than when running at full load, but owing to the partial vacuum in the system complete vaporization still takes place.

The vaporizer is initially heated by running the engine for 3 minutes, on petrol after which it will run on paraffin, or it may be initially heated by a blow-lamp. When the engine is hot it will start on paraffin without the use of petrol. This may be done as late as 1½ hours after stopping. A centrifugal governor acts directly on the throttle and the speed at which it governs is controlled by a hand lever.

The Gleniffer patented reverse gear depends for its action on a principle which is a completely new departure for this class of mechanism.

The working of the gear may be followed by reference to the line drawing, in which A is the after end of the crankshaft, B is an extension of the fly-wheel rim, the inner surface of which forms the ahead driving clutch, and C is the corresponding driven member. E is a stationary clutch member which engages with D. C and D form one part with the sleeve F which is a sliding fit on the drum G and is constrained to move along this drum in a helix by means of the keyway H and the key K, this key being secured to the sleeve F. Within the drum G is contained an ordinary bevel epicyclic train of wheels. The driving wheel is keyed to shaft L and the driven wheel to shaft M. These are two intermediate pinions supported on pine N secured to the drum. The gear is operated by the lever Q acting through the collar P by means of which the clutch sleeve C D F may be moved into engagement with either B or E. The gear as shown is arranged for an engine, the shaft of which revolves as shown by the arrow on the shaft A.

When the clutch member C is brought into engagement with member B the member B tends to drive it in the same direction as the arrow, this in turn forces the key K against one side of keyway H and causes a longitudinal thrust which thrusts the clutches firmer together. This thrust is proportional to the torque transmitted and maintains the clutch members C and B in contact with sufficient force to transmit the power of the engine. As soon as a force is applied pulling the clutches apart, by means of the operating gear, the force of contact between the clutch members is reduced and allows slipping to take place and the clutch offers no further



"GLENIFFER" VAPORISER

(PATENTED)

resistance to disengagement. When the clutch members C and D are in mid position, *i.e.*, in neutral the driven shaft M is stationary. At the same time the drum G is idling round. To obtain the reverse motion the clutch member D is engaged with the stationary member E. A longitudinal thrust is now produced by the keys in the helical keyways which maintains these two clutches in engagement in an exactly similar manner to the ahead clutches. By this means the drum G is brought to a standstill and the action of the bevels is to give an astern motion to the shaft M, which revolves at the same speed as the engine.

It will now be seen that the operating gear is only necessary to engage or disengage the ahead or astern clutches. As soon as either of them is engaged the torque of the engine holds it in engagement. It will also be observed that any wear which takes place on the clutch surfaces will not affect the working of the gear, which requires no adjustment whatsoever. The operation of the gear is very simple and sweet in action. This gear is entirely independent of propeller thrust for engagement of the clutches thus eliminating the difficulties experienced in gears of that type in which the thrust varies inversely with the boat speed for a given power of engine. It also eliminates the inavoidable force and aft movement of the propeller shaft that is inherent to that type of gear.

## Singapore Exhibition Diploma Award to Gleniffer Motors

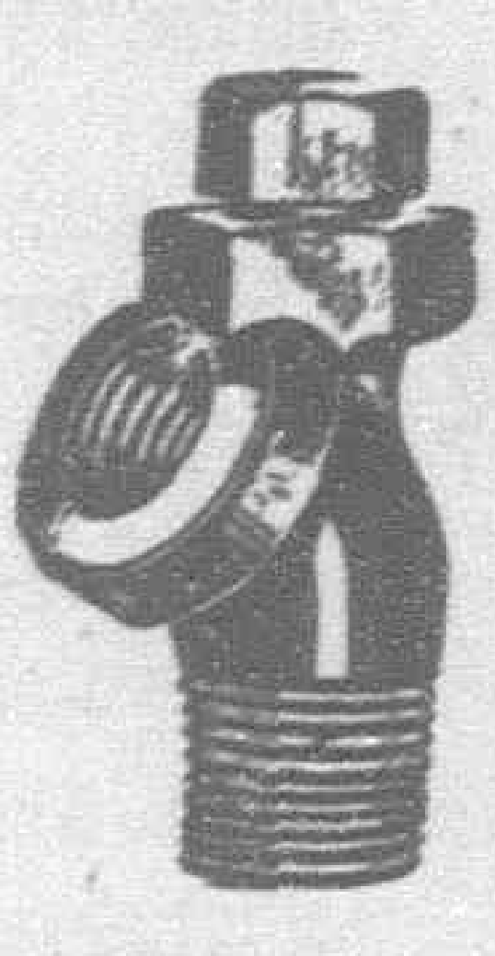
One of the features of the marine side of the Malaya-Borneo exhibition held recently at Singapore was the exhibit of Messrs. Ritchie & Bisset who are sole agents for Malaya for Gleniffer Motors, Ltd., Anniesland, Glasgow. Their exhibit obtained first mention amongst the few diplomas awarded for imported marine machinery.

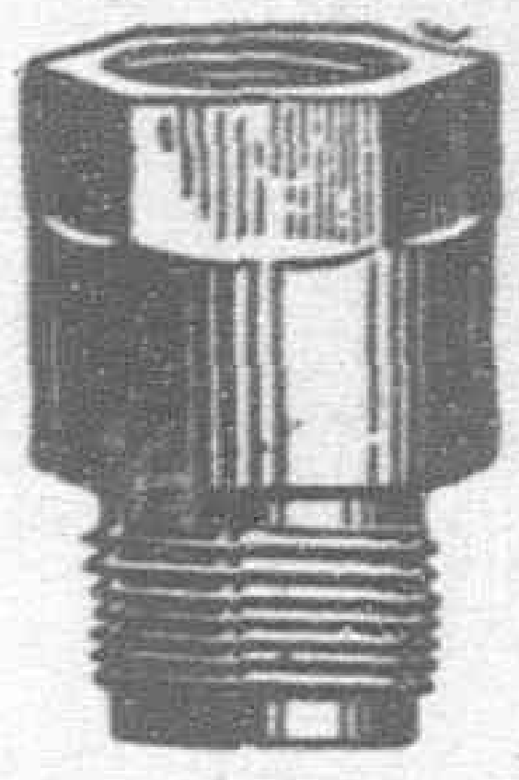
On show was one of the new model K2 engines fitted with glass crankcase and flywheel casing doors, and fixed on bearers having a rake of 1 in 7. Electric lights were fitted inside the crankcase. This engine was driven by an electric motor and belt and the most efficient lubrication by Gleniffer's patent system was shown in operation. Near at hand was one of the model L.10/12 H.P. engines, also one of the new M.4 24/28 H.P. engines complete with all the standard outfit. The latter engine should prove very popular with Far Eastern buyers. A demonstration reverse gear and a sectional vapouriser—both being Gleniffer's latest patents and fitted on all new models—were also on view, and, together with a selection of spare parts, made a very interesting show.

Also on exhibit was a 25-foot teak motor boat fitted with a model L.10/12 H.P. engine. The hull was built in Singapore by Chinese workmen and is a fine example of the local boatbuilder's art.

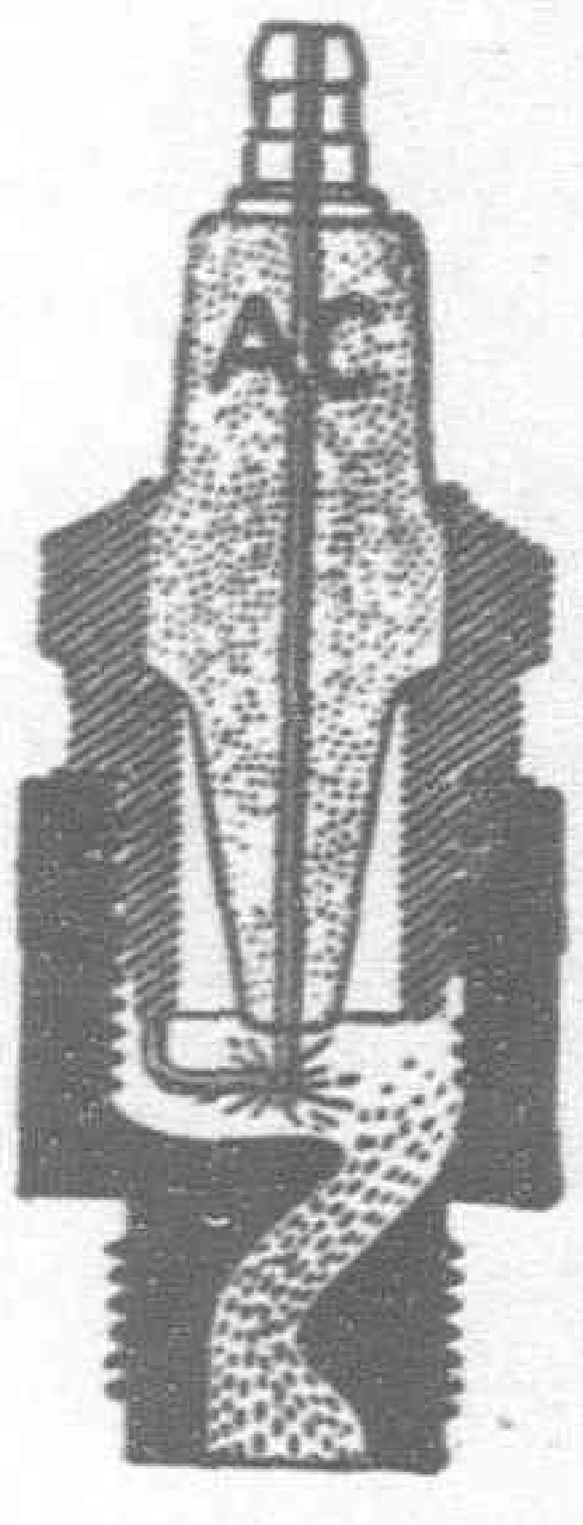
## Increasing Spark Plug Efficiency

IGNITION trouble is one of the most common causes of annoyance to the motorist. Engineers are constantly endeavoring to invent means of eliminating all defects in motor construction that prevent a regular and efficient sparking A device designed to accomplish this result, and being placed on the market by the Gemco Manufacturing Company, Wisconsin, is the Baf-Oil Plug.

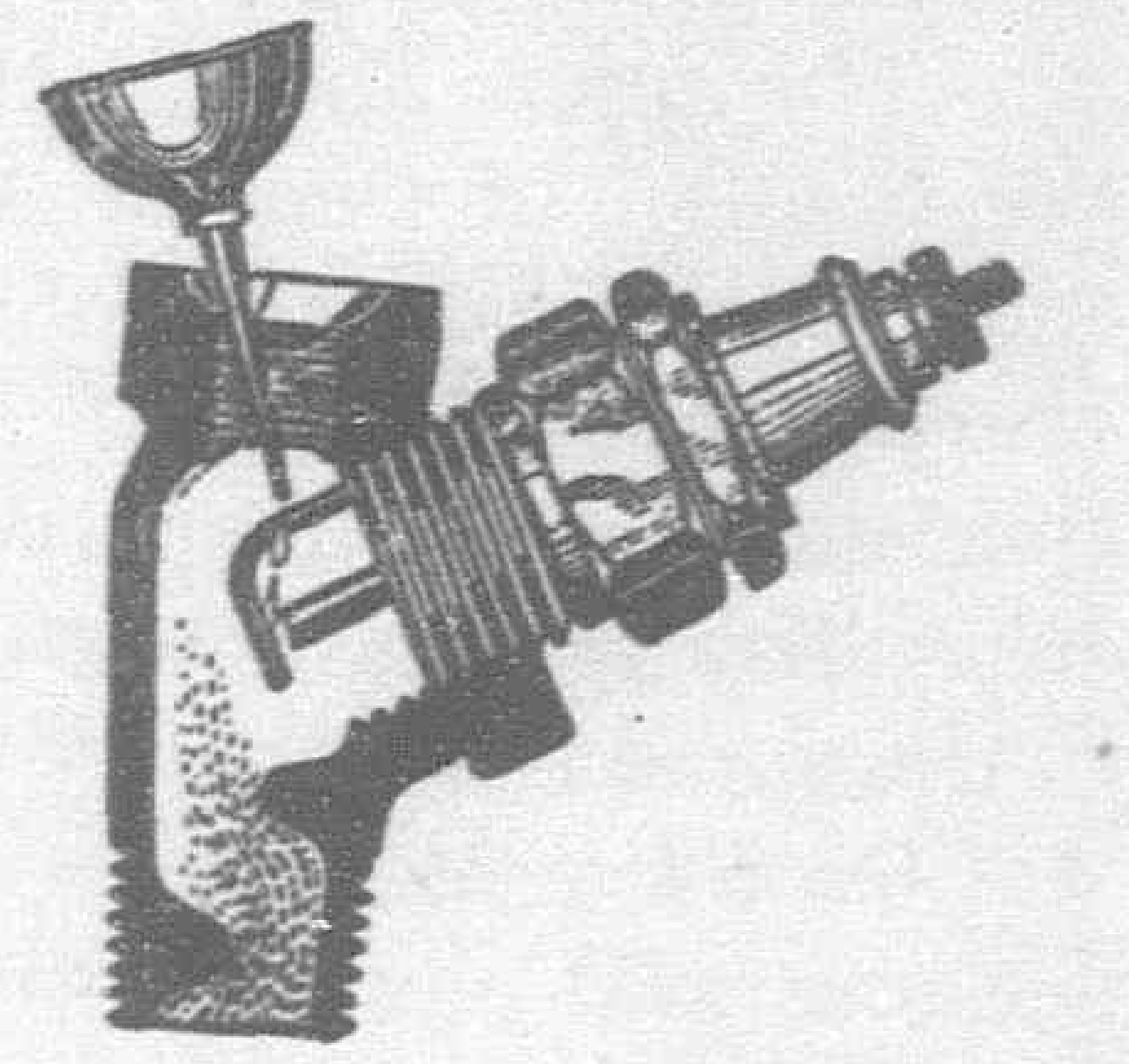

½-inch Size Plug


⅞-inch Size Plug

The plug consists principally of a combustion chamber into which the spark plug is screwed in the usual manner. There are two baffle plates in each chamber which prevent the oil from reaching the firing points. Each plug is a complete unit in itself and has no mechanical contrivance to wear or get out of order. The illustrations show clearly the operating principle of the device.

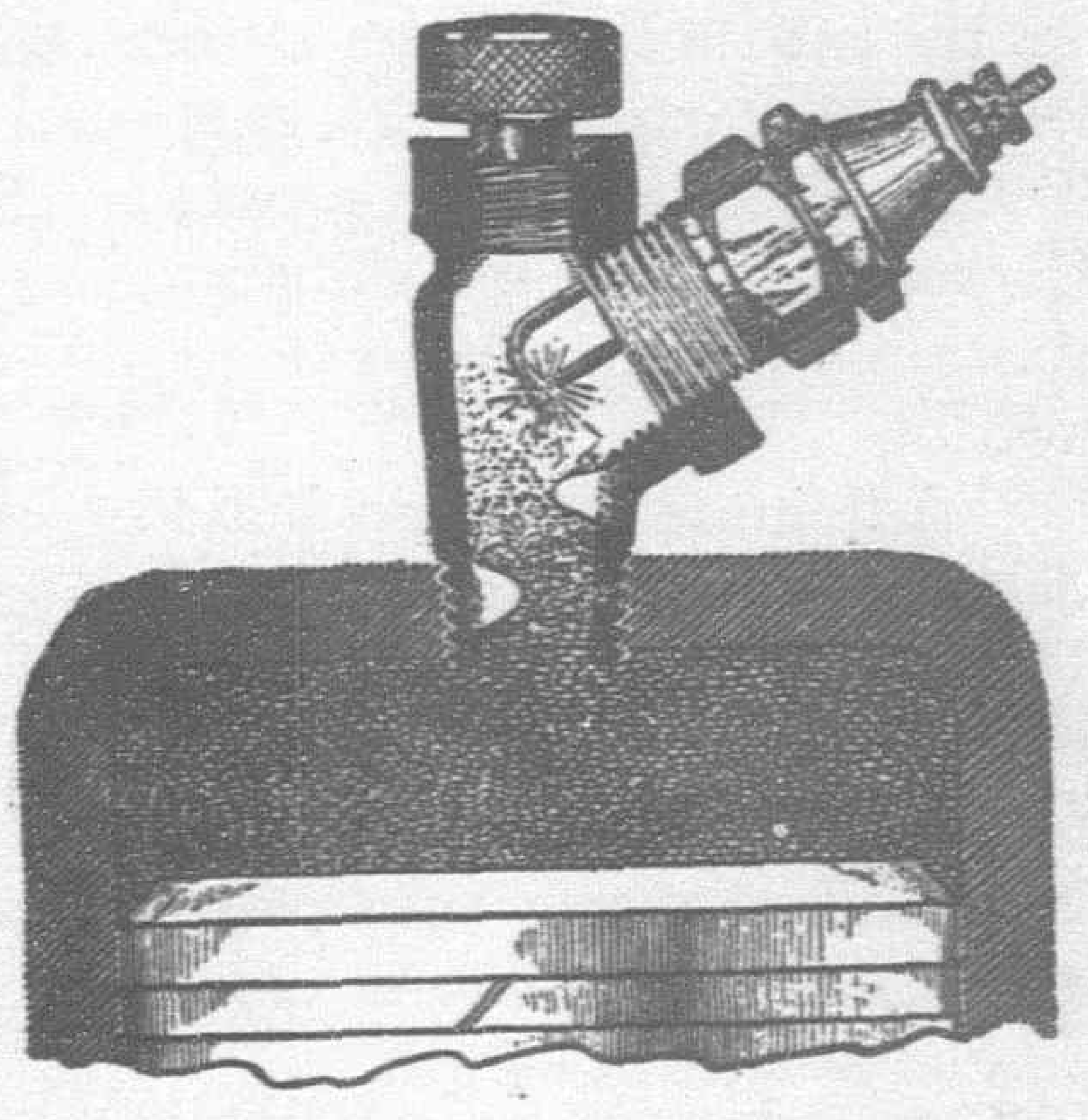


Cross Section of Plug


Showing Method of Priming

In addition to keeping the oil from reaching the firing points, the baffle plates, becoming extremely hot while the motor is in operation, act as hot spots which it is said completely vaporize the gasoline. When the spark occurs, the vaporized gasoline in the combustion chamber ignites and enters the cylinder proper, causing a clean explosion, increasing the power of the motor and reducing carbon deposit.

The Baf-Oil Plug is made in two sizes, ½-inch and ⅞-inch. A priming feature is included in the ½-inch size which is highly desirable, especially in cold weather.


Complete Installation of Baf-Oil Plug

## Tokyo's Revised Automobile Tax Schedule

### (These Rates Became Effective April 1st)

| | 1922 | | | | 1921 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Classification: | Prefectural Tax | Regular City Tax | City Planning Special Tax | Total | Prefectural Tax | Regular City Tax | City Planning Special Tax | Total | Reduction as compared with Last Year |
| Personal Use. | | | | | | | | | |
| 20 H.P. or more | Y.255.00 | Y.469.20 | Y. 63.75 | Y.787.95 | Y.300.00 | Y.543.00 | Y.120.00 | Y.963.00 | Y.175.05 |
| 15 H.P. or more | 200.00 | 364.00 | 50.00 | 614.00 | 210.00 | 388.50 | 84.00 | 682.50 | 68.50 |
| 10 H.P. or more | 131.00 | 241.04 | 32.75 | 404.79 | 131.00 | 247.59 | 52.40 | 430.99 | 26.20 |
| 5 H.P. or more | 79.00 | 146.15 | 19.75 | 244.90 | 79.00 | 150.10 | 31.60 | 260.70 | 15.80 |
| Less than 5 H.P. | 44.00 | 84.04 | 11.00 | 139.04 | 46.00 | 89.24 | 18.40 | 153.64 | 14.60 |
| Commercial Use. | | | | | | | | | |
| 20 H.P. or more | Y.120.00 | Y.220.00 | Y. 30.00 | Y.370.80 | Y.150.00 | Y.271.50 | Y. 60.00 | Y.481.50 | Y.110.70 |
| 15 H.P. or more | 86.00 | 156.52 | 21.50 | 264.02 | 107.00 | 197.95 | 42.80 | 347.75 | 83.73 |
| 10 H.P. or more | 60.00 | 110.40 | 15.00 | 185.40 | 67.00 | 126.63 | 26.80 | 220.43 | 35.03 |
| 5 H.P. or more | 40.00 | 74.00 | 10.00 | 124.00 | 41.00 | 77.90 | 16.40 | 135.30 | 11.30 |
| Less than 5 H.P. | 24.00 | 45.84 | 6.00 | 75.84 | 24.00 | 46.56 | 9.60 | 80.16 | 4.32 |

The above automobile tax rates are those which will be effective in Tokyo for the remainder of the present year, the old levies having been revised to take effect April 1. This chart shows in detail the new rating for each classification of car, both in its component parts and in total, as well as the old rates. The last column gives the amount of reduction which has been made for each class of machine.

# General Motors Opens Largest Office Building in the World

THE new General Motors building in Detroit, Michigan, U.S.A., which has been in the process of construction for the past two years, is now practically completed. Already, half of the offices are occupied, and the entire building is the scene of ceaseless activity.

Fifteen stories in height, covering an entire city block, with a total floor space of 1,200,000 square feet, and containing approximately 2,500 offices, this single building, said to be the largest office structure in the world, will, when present plans have finally been carried out, house no less than 6,000 office workers—a number sufficient to support a population of 30,000.

The main floor, with its great show rooms, is intended for the display of General Motors products. Ultimately, it is going to be an all-year automobile show, and will be brilliantly illuminated every night of the week. At the present time, Buick, Chevrolet and Oakland cars are displayed there, and within a short time all the other important units of the General Motors lines will be quartered in the same building.

On the ground floor, there is a large auditorium, seating 1,500 persons, and equipped with a stage and other complete appointments. This will be available for meetings and assembly purposes of all kinds.

The second and third floors are devoted to general office use, and already representatives of the spare parts and accessory manufacturers serving the automobile and allied trades are filling up the offices to such an extent that the building promises to be a real headquarters for this particular division of the motor industry. Twelve floors will be reserved for office space for the General Motors Corporation, and its affiliated companies. The building will also contain a bank, railroad ticket offices, and telephone and telegraph stations.

Adjoining the main building are the engineering laboratories, devoted to part of the important research activities of the General Motors Corporation. These are in one building 500-ft. long and 60-ft. wide, and equipped with the most highly developed apparatus for testing manufactured units in all stages of production. An independent power house with a reserve capacity sufficient to meet all possible demands is connected with the main building by a tunnel 368-ft. in length.

The General Motors building is located at the geographical centre of Detroit, near the intersection of two main arteries of street traffic. Already, its opening has stimulated the growth of business in its vicinity. Anticipating the future growth of Detroit in this direction, this new building has been built to endure for 100 years or more.

## French Road Builders Announce New Methods

The French, ever to the fore in matters of highway development, have just announced a new type of highway, which gives promise of solving some of the difficult problems of those who build roads. The surface of the road is composed of a new material compounded of concrete, iron and cement. The first completed section of this type of construction was recently inspected by French, British, Belgian and American highway engineers and the chorus of unqualified praise augurs well for the future.

In construction a great trench is first constructed and in this a layer of concrete is placed, approximately five inches thick. On top of this is placed another layer of pure cement of the same thiskness. In the cement are placed large iron studs, 25 to the square yard. This mass is then covered with a layer of fine concrete, which is laid on before the cement below is quite dry. The whole is then thoroughly cured by the water process and the result is claimed to be the best road seen in Europe since the highway builders of the Roman empire threw up their job.

# A New Air-Cooled Motor Cycle Engine

THE design of engines for motor cycles presents many problems of interest to the engineer and of great importance to the manufacturer. Simplicity, robustness, reliability, smoothness of running, efficiency, and many other qualities have to be combined in a machine which must in the end be cheap. Mainly because of this last factor, many refinements employed in the motor car engine cannot be adopted in the motor cycle engine. Such conditions offer a clear stimulus to the skilful designer, and a new type of engine produced by a British firm marks a considerable advance towards the ideal. It is an air-cooled motor-cycle engine with sleeve valves. Hitherto the use of the sleeve valve in any type of motor car engine has been looked at a little askance, owing to expected trouble with lubrication and cooling. These troubles are not encountered in the numerous examples of automobiles fitted with sleeve-valve engines; and their success has led this firm to adopt the sleeve valve in an air-cooled engine—the first time this combination has ever been attempted. One great advantage of the sleeve valve is its silent action, the public will be grateful for any reduction in the noise made by motor cycles. The new engine has a single cylinder and gives a nominal output of 3 horse-power, but it can give a much higher power than this over-long periods. As much as 7 horse-power is produced at 7,000 revolutions per minute. Its total weight is only 50-lbs. The number of parts in the engine is much less than in the ordinary type, and every detail is first-class in material and workmanship.

To aid the motorist to give intelligent care to his tires, the technical service department of the United States Tire Company has prepared a number of folders of specific technical information. Folders issued to date are entitled "Nomenclature," "Flaps" and "The Use of 31 by 4 Tubes in 30 by 3½ Clincher Cord Casings." Other folders will be published as the need arises.

GLENIFFER

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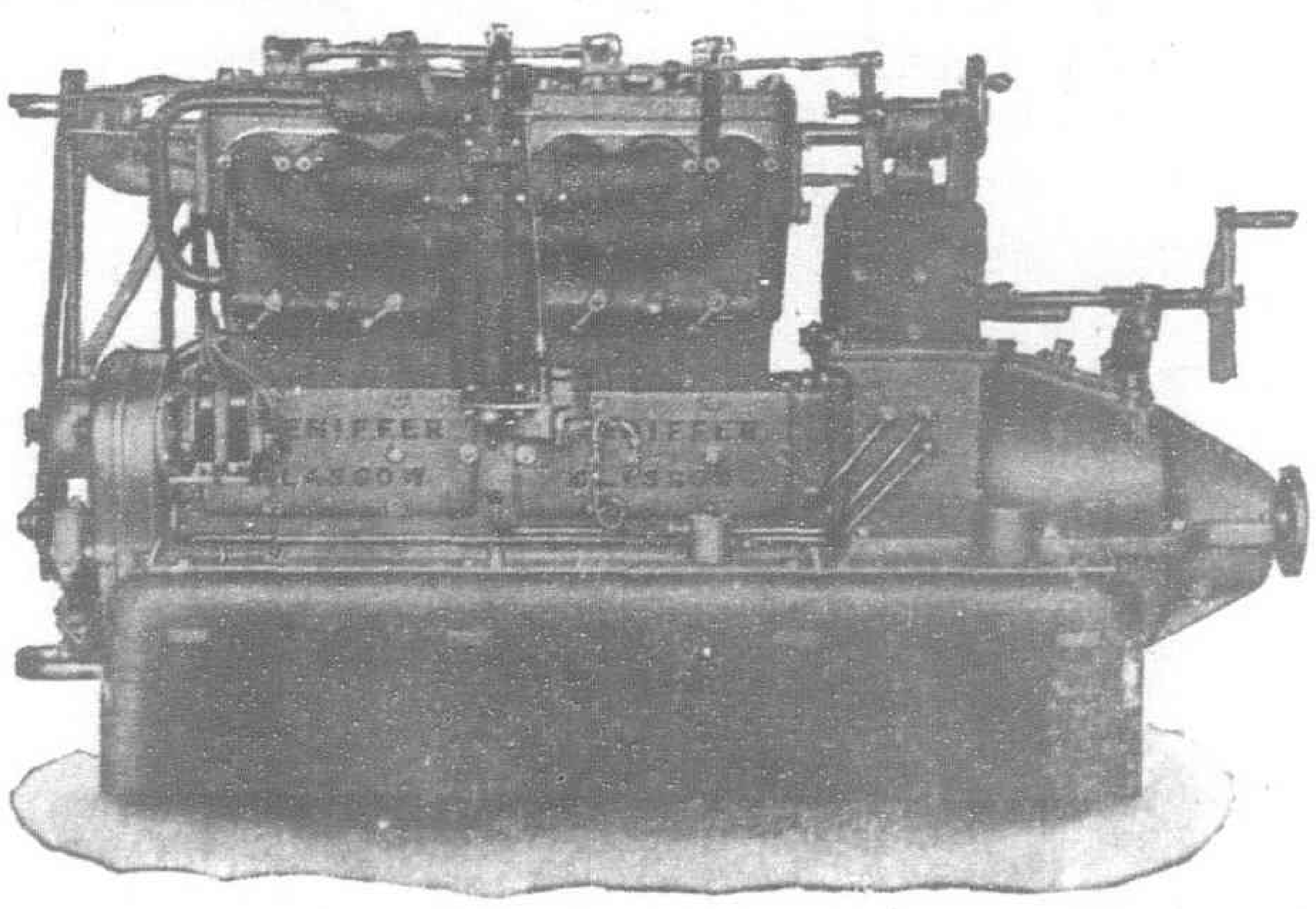

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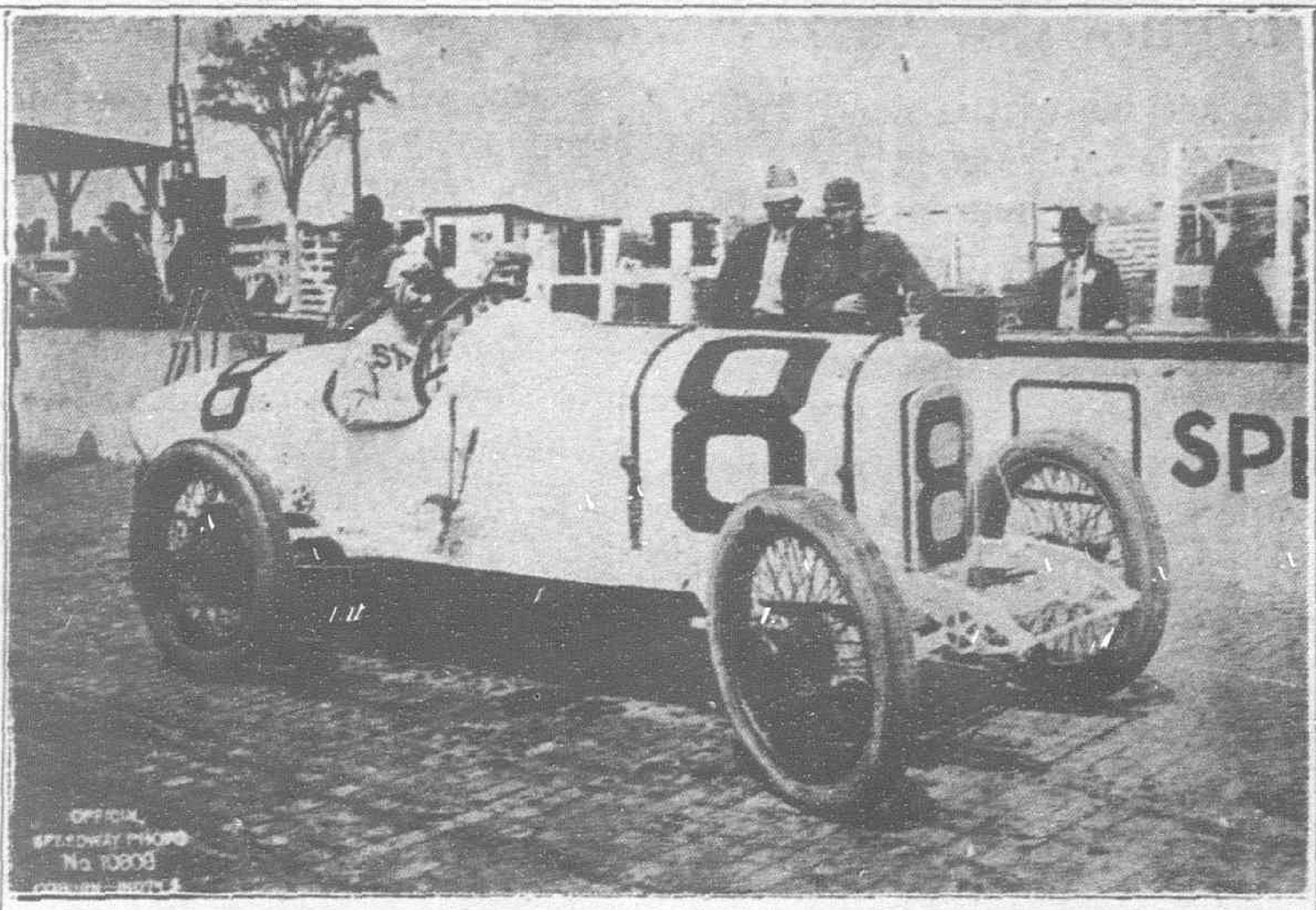
We are proud to state that No. 677 has justified the labor and expense devoted to a really intelligent effort to produce an ideal gear lubricant. It has successfully stood the test of years. There is nothing like it on the market. It is the grease the "Speed Kings" use.

No. 677 is graphited grease of medium density that flows over the gears like an oil, yet possesses the peculiar property of not settling when the gears are not in motion. It reaches all the bearings and provides a graphite coating that prevents wear, reduces friction and causes cool running at all times. No. 677 remains unchanged in hot or cold weather. It will last far longer than the best plain grease.

No. 677 is recommended for transmissions and differentials, except those designed for light oil lubrication. The consistency is about that of heavy gear oil. It is also the most satisfactory lubricant for electric gear shift mechanisms, the reverse gears of power boats, and for change-speed gear boxes of motorcycles.

Sold in one, five and ten pound tins. Larger packages if desired.



"Dixon's Graphite Automobile Lubricants are about as necessary to a racing car as gasoline. I like their kind of lubrication for my cars."—EARL COOPER

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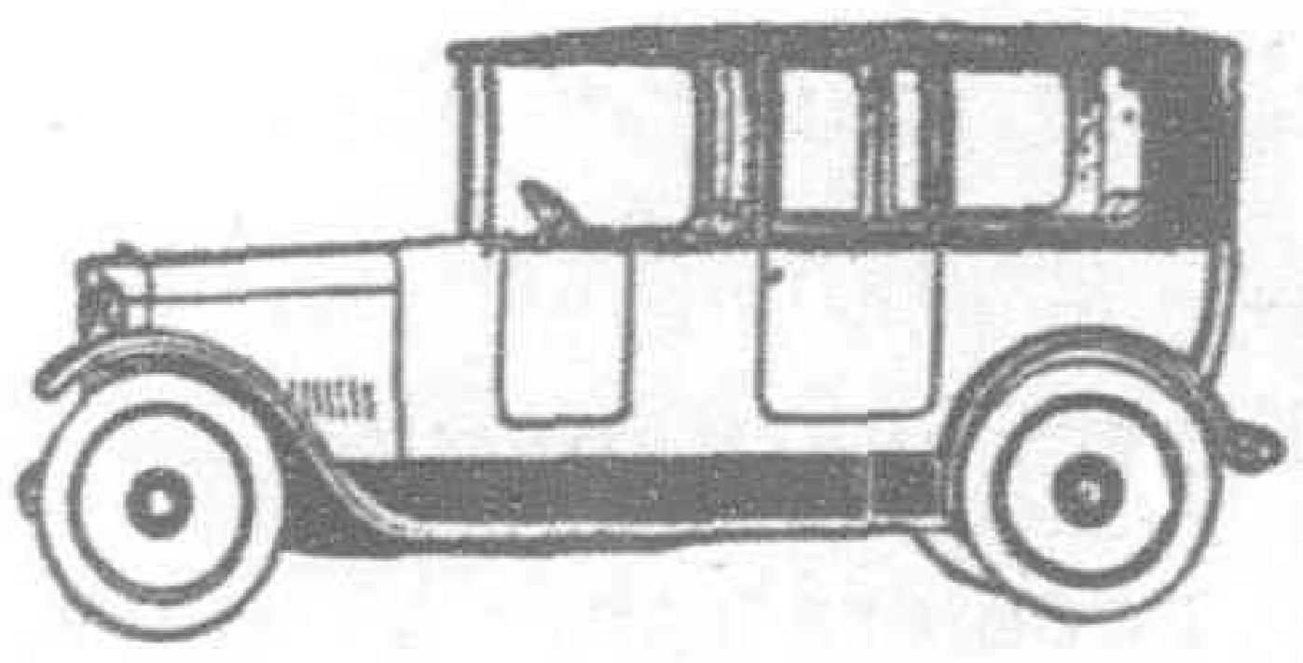
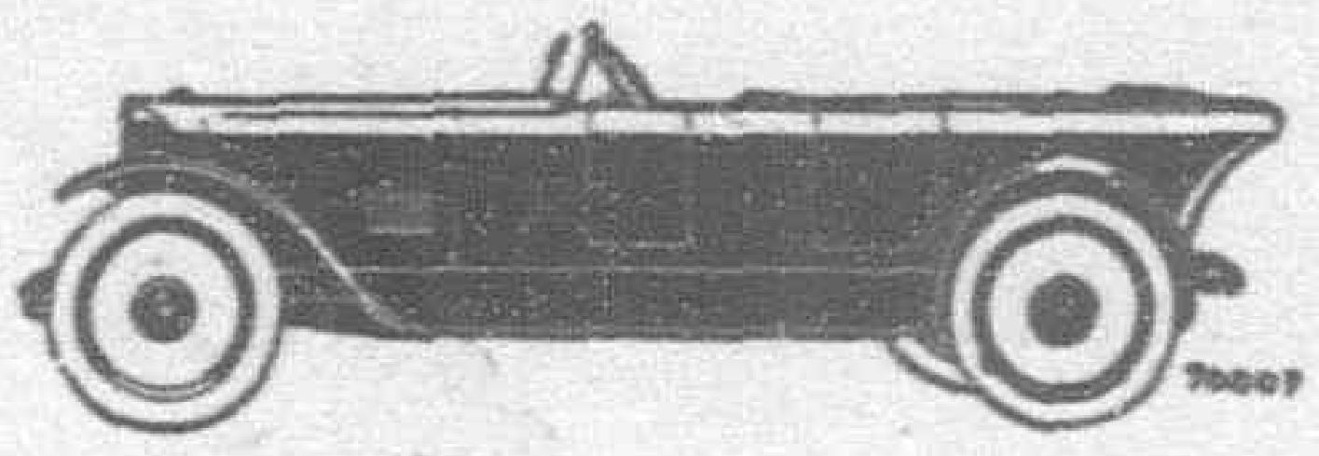
Cup Greases containing fine flake graphite reduce friction to a minimum. By using these high-grade graphited greases, bearings soon acquire the well-known graphite polish that eliminates friction and causes easy running. Use in all grease cups, wheel spindles, etc.

Dixon's Graphite Cup Grease No. 3 is recommended, except in warm climates, where No. 5 is more suitable. The consistency of each grade changes but little under wide temperature variation.

The importance of attending to the numerous small bearings and moving parts of cars is frequently overlooked. Wherever you see a grease cup don't think it is put on as an ornament, but give it a turn once a day or once a week according to the requirements. Don't forget to keep the cups filled with grease.

Sold in one, five and ten pound tins. Larger packages if desired.





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# Manila's New Automobile Tax

THE following are the principal provisions of the new Manila *automobile tax law which went into effect recently* :—

Exemption from license is granted to automobiles and trucks belonging to the United States, insular, provincial and municipal governments ; those not regularly kept and used in the city of Manila, and those for personal use of the consular representatives of foreign nations.

On each passenger vehicle an annual tax shall be paid as follows : Twenty-five centavos for each horse power, one centavo more per kilogram, gross weight, for each vehicle equipped with solid or pneumatic tires, and two centavos additional for each kilogram of gross weight of the vehicle and load when equipped with metal tires. All vehicles for rent in the streets or plazas or in garages and other places for public hire, also all cars registered by the bureau of public works in classes "H," "G" or "P.U." shall pay double the above taxes.

Gross weight for a passenger vehicle means its actual total weight, loaded, calculating 70 kilos for each passenger.

All motor trucks, whether used for cargo or passengers, shall pay a tax of P.40 for the first ton capacity and one centavo for each additional kilogram capacity.

Trailers of less than two metric tons capacity must each pay P.10 annually and those of larger capacity P.20 annually.

Motor cycles without side cars are taxed P.3 a year, and those with side cars P.5.

If original application for license comes between January 1 and March 30, the full year's tax shall be paid ; if application is made in the second quarter, only three-fourths of the annual tax shall be paid ; if in the third quarter, one-half of the tax is assessed ; and during the last quarter, only one-fourth of the annual tax will be required.

All the money collected from this tax goes to the fund for the construction and repair of the streets of Manila.

Fines for violation range from P.25 to P200, inclusive.

## Siam's Motor Imports

According to the department of overseas trade report on the commercial situation in Siam, motor cars (six) at a value of ticals 35,090 (£3,110) were imported from the United Kingdom and ninety-five valued at ticals 377,787 (£33,491) from the United States.

Motor car parts to the value of ticals 116,434 (£10,322) were imported from the United States. From these figures it will be gathered that there is room for more business in the line in his majesty the king of Siam's dominions.

## Motor Trucks in Japan

Although the Japanese government encourages local manufacture of motor trucks by granting a bounty for cars built according to military specifications, output does not meet demands. United States exporters are busy in Tokyo and Osaka, where exists the most promising outlet for such vehicles. Widened roads and strengthened bridges are expected to create a demand in the smaller cities and country districts.

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Entrusted with a mission of propaganda through the United States of America, General Diaz, head of the Italian army, met with an enthusiastic reception wherever he passed. The object of the mission was to bring home to the American people the efforts of the Italian nation towards the securing of victory in the great war, and the desire of this people to help forward universal peace.

Naturally the motor car played its part in the demonstrations of the American people, for whereas in the Old World an official procession is made up of carriages drawn by prancing horses, in the United States the motor car only is used to carry distinguished visitors through the city streets. Picturesqueness was added to these scenes by the presence of Italian soldiers in full uniform, with mounted American police acting as a guard of honour.

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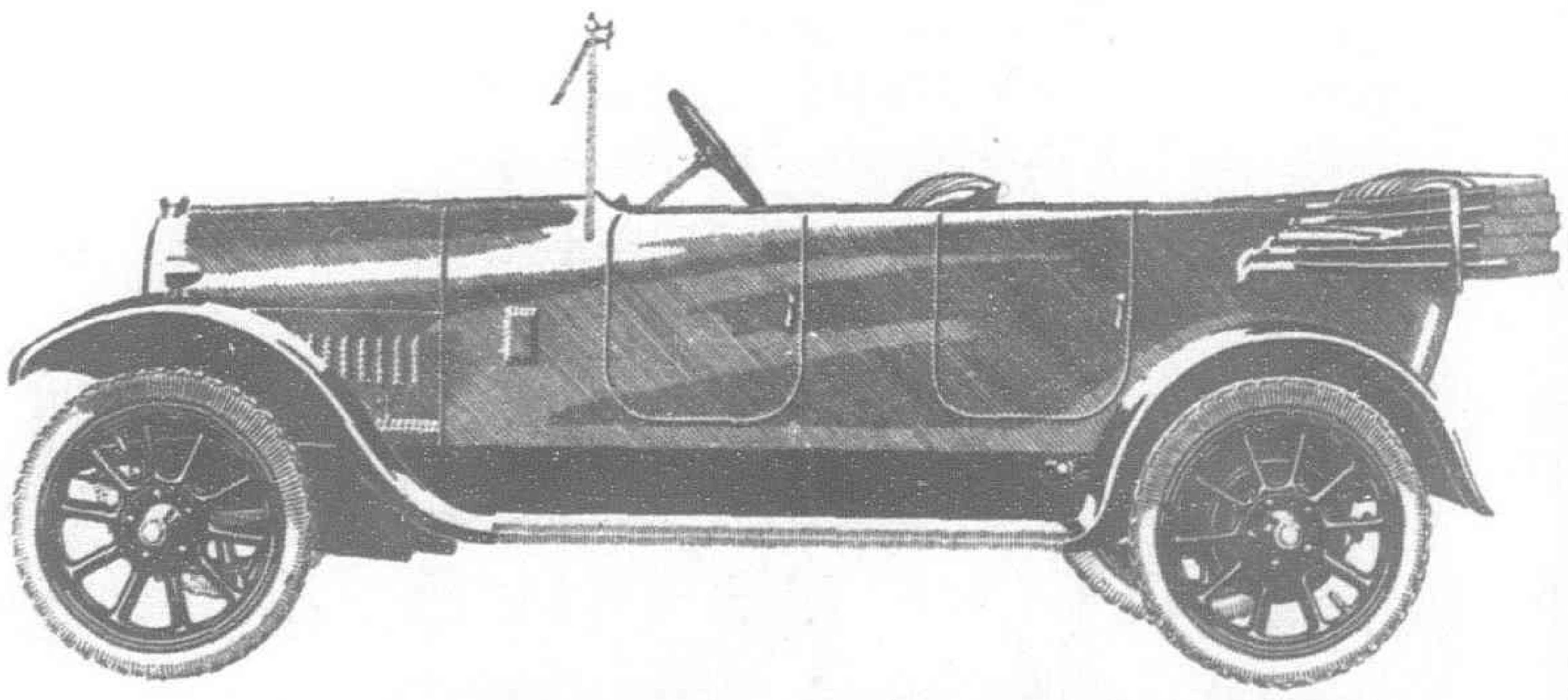
Cars of Comfort and Refinement

THERE is a general consensus of opinion among motor experts and owner drivers that a Humber Car is typical of all that is best in motor car design and construction. Indeed we have contrived to put into every model an engine with wonderful flexibility and acceleration, a thoroughly sound well-balanced chassis, and a body the comfort and refinement of which contribute in no small measure to the Humber reputation.

*Full Particulars Sent on Request.*



Humber 11.4 H.P. Four-Seated Model

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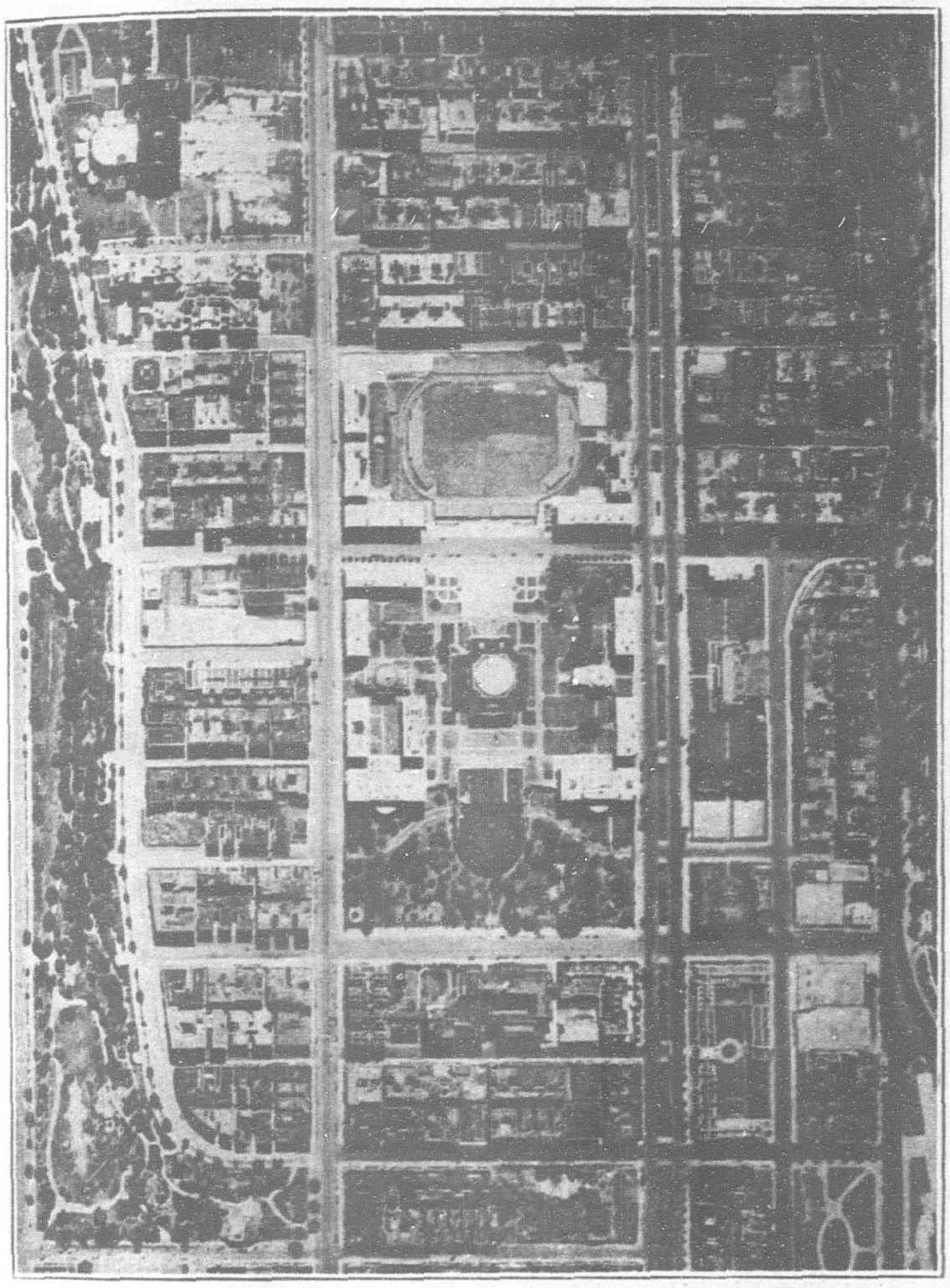
# Aerial Photography



A SECTION OF THE NEW YORK MOSAIC MAP

It is the Morning-side heights district. The white circle in the centre is the dome of the Columbia University Library. Just below may be seen the south field. In the lower right-hand corner may be seen the St. John's Divine. Note the seven chapels at the right and at the left the foundation of the uncompleted Cathedral. Along the right side of the picture may be seen the Morning-side Park and in the extreme upper corner Grant's Tomb. This view is one of the one-hundred vertical photographs that go to make a complete Mosaic of Manhattan Island. The view is a permanent record made by one flash of the shutter.

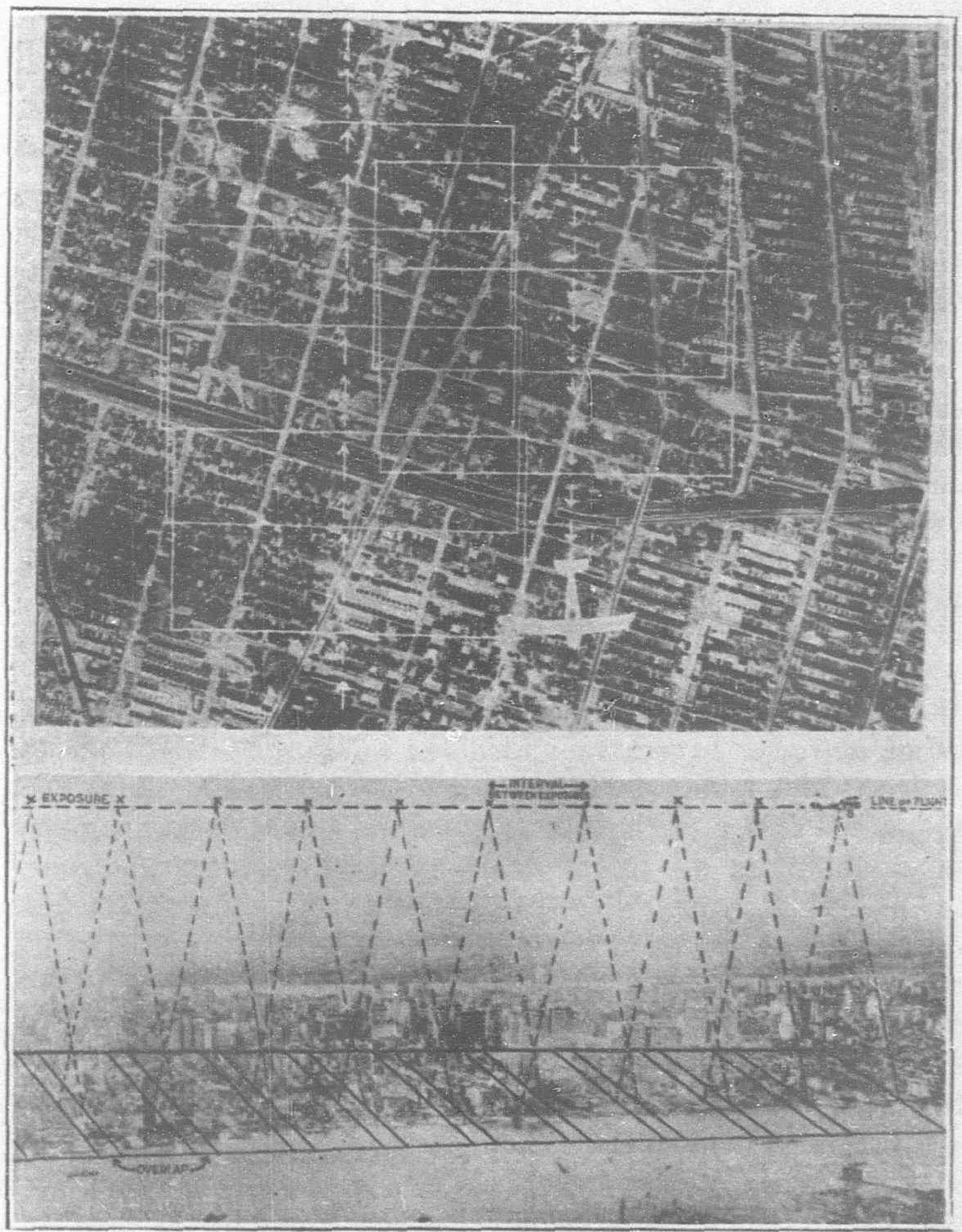
AMERICA has added another important invention to her rapidly increasing number of distinctive achievements in aviation. It is the perfected aerial camera which has just given a remarkable demonstration of efficiency in a photograph of New York city from the air. Municipal engineers say it will save many thousands of dollars and years of engineering work in effecting public improvements. The photograph is more than 8-ft. long and 20-in. wide. It shows more than 32 square miles of the metropolis, every street, building, vehicle and person out of doors, just as one would see it looking down straight upon it from a position high overhead.

The machine which made the photograph possible is a big camera with several new devices invented by Sherman M. Fairchild, president of the Fairchild Aerial Camera Corporation, 136 West Fifty-second Street, New York. His experiments the last three years have been directed toward making the camera accurate and economical, the main essentials in practical commercial photography, particularly aerial maps such as that of New York.

Inaccuracy has been the chief difficulty with various kinds of apparatus employed heretofore. Many technical problems were overcome by the Fairchild inventions which so improved the mechanism and actual work of this new camera that the results were better than 99 per cent. accurate—more than sufficient for all practical purposes, according to municipal officials and engineers and those of large corporations who see in this development limitless possibilities for saving time and money in many branches of their work.

The New York photograph is a vertical one; that is, it was taken from an airplane flying directly overhead, and is known technically as a mosaic; or aerial map. Using a film similar to the ordinary camera, though larger, and regulating its exposure by means of an electric timing device gauged to the relative speed of the airplane from which the camera was operated, Fairchild succeeded in removing the hundred and one difficulties which have delayed commercial progress in this kind of mapping.

Plotting the city into rectangular sections of a scale so that each section could be photographed individually from the plane right over its exact centre, the entire city from the Battery to Van Cortlandt Park was divided into 100 parts. Each of them was photographed. The hundred photographs were taken in a single flight of 69 minutes. As the plane passed over the centre of each rectangular section there was an automatic click of the camera, and the film automatically rolled into position for another exposure a few seconds later. When the sections had all been "snapped," Fairchild had 100 photographs, all together totaling an area of approximately 32 square miles. They were then fitted together like a picture puzzle and mounted on cardboard—and there lay New York, with everything out of doors plainly visible and accurate in size and location.



A diagram showing how thrty-two square miles of New York was plotted and photographed in sixty-nine minutes with a modern aerial, mapping camera. Above is a plan of the area. Below is a cross-section diagram showing the method of procedure.

# Effect of Tropical Climates on Airplanes

IN a lecture before the Royal Aeronautical Society (England) Air-Commodore H. R. M. Brooke-Popham, vice chairman of the society, gave an interesting description of the new desert route between Cairo and Baghdad. He also dealt with the various difficulties to be overcome in flying airplanes in tropical climates. He expressed the opinion that machines built, as at present, of wood are satisfactory so long as they are only to be flown in Egypt or Mesopotamia; but when it comes to machines flying regularly between England and these countries metal construction will probably be necessary. Shrinkage of timber as a result of the climate he considered more of a nuisance than a danger, but he thought it desirable that wings should be sent out from England uncovered with fabric, as in any case they have to be stripped on arrival for adjustment of internal fittings. Conditions are a good deal worse in Mesopotamia than Egypt, chiefly owing to the very great changes in temperature and humidity of the atmosphere during the day. In the desert there are sudden changes in the direction of the wind, which are very disturbing. On one occasion, just after midday the wind kept changing from east to north and back again in a few seconds. Two hours later it had completely died down, while five minutes later it was blowing steadily from the West. Wastage in propellers is high, from splitting owing to heat and damage from small stones. Tires were another big item in upkeep, and petrol constituted a heavy expense owing to evaporation and the carelessness of native labor in handling the container. Provided that extra radiators are fitted there does not appear to be much engine trouble specially due to the climate either in Egypt or Mesopotamia.

# Hopping Off the Cliff

A CONTRIBUTOR to *The Motor* (South Africa) states that, according to stories told by the natives of Hawaii, all the thrills of flying were enjoyed by the Hawaiians centuries ago. Their ancestors secured their aerial excitement by jumping off cliffs into the sea in home-made airplanes. They made a regular game of it, known as "lele pali," or "jumping from the cliff." It was played up to a hundred years or so ago by natives who lived near groves of loulu palms, near high cliffs overlooking the sea. The game was played with large contrivances built of light but stout sticks and overwoven with loulu palm leaves. Several of these affairs were made ready, the Hawaiian "aviators" took their seats and were pushed over towering cliffs. The adventurer who remained longest in the air was the winner. Frequently an airplane, owing to the carelessness or over-excitement of its "pilot," executed a nose dive after the fashion of the twentieth century machines. The only damage was the loss of the game. Old Hawaiians say that their flying men were exceptionally skilful. The only means they had of guiding their crude appliances was to shift their weight to maintain balance as they zigzagged down toward the sea. A fleet of outrigger canoes was anchored off shore to pick up the sportsmen and retrieve the "planes." Exceptionally daring Hawaiians, it is said, often hopped off thousand-foot cliffs on the mainland.

# Progress of Civil Aviation in Great Britain

IN a memorandum on the development of civil air communications within the British Empire, prepared by the department of civil aviation, it is stated:

"The development of communications is one of the most important phases in the growth of modern civilization, which depends to an ever-increasing extent on the interchange of thought and the intercourse of individuals. Steam, cable and wireless have each in turn been evolved to expedite intercommunication, but just as the roads of the Roman empire failed to keep pace with the requirements of the time, so modern communications are insufficient for an empire stretching from Great Britain to Australia and the Pacific Ocean. Cable and wireless are limited in scope; yet, as each portion of the empire assumes greater responsibility, there is a greater need for co-operation, the distribution of information, and the personal contact of statesmen. That necessity is the mother of invention is a motto particularly applicable to modern conditions, and by discovering how to fly human ingenuity has taken a further step in solving the problem of communication so essential to the existence of our empire.

"Civil aviation aims at the building up of a productive organization to a position similar to that held by our mercantile marine."

## Non-Stop Flight Competition in Japan

The fourth non-stop mail flight, open to civilian aviators, held under the auspices of the Imperial Aviation Society on November 3rd, was participated in by six entrants, only two of whom covering the prescribed distance of 362.5 from Kanazawa and Hiroshima. The planes used were either made in Japan or reconstructed from foreign planes. Neither of the two successful entrants covered the prescribed distance within the time limit of four hours, the time for the plane finishing first being 4 hours and 10 minutes, and for the second 5 hours and 33 minutes.

## Airplane Markings in Japan

The mark of recognition for the airplane is a sun in red, displayed at each end of the upper surface of the upper wing and of the under surface of the lower wing, as well as on each side of the body (or on each side of the frame if the machine is of the frame system). The name of the airplane is displayed above the number on the rudder, and the number is displayed in Arabic figures on each side of the rudder, or on each outer side (if there are two or more rudders) and on the under surface of the lower wing with its head to the front.

## France

Two French airmen, MM. Deulin and de Marmier, have brilliantly mapped out the Paris-Constantinople air route by their initial flight out and back in 35 hours of actual flying. After leaving Paris they made long halts at Strasbourg, Prague, Budapest, Belgrade and Bukarest. The distance of 1,770 miles from Paris to Constantinople was covered in 17 hours of effective flight. The return journey from Constantinople to Paris was made in 18 hours of actual flight.

# International Aviation Races in Italy

THE Italian minister of war has just approved a plan submitted by the chief of air service (Comando Superiore di Aeronautica) for several big international aviation races and competitions to take place in September, 1922. The object of these competitions is to increase the creation and construction of new types of airplanes, and prizes will be taken from air service funds appropriated for that purpose.

The first race will be known as the "Grand Prize of Italy" and will be for airplanes. The prizes for this competition will consist of a cup valued at 30,000 lire, a first prize of 150,000 lire and a second prize of 50,000 lire.

The second race will be known as the "Grand Prize of the Tyrrhenian Sea" and will be for seaplanes. In this competition the prizes will be of the same amounts as those for the "Grand Prize of Italy."

In addition to the prizes, 400,000 lire will be spent for the purchase of the Italian airplanes which make the best showing in these two competitions. As at present outlined, each race will be 2,000 kilometres over a circuit not less than 500 kilometres in length. In addition to these two races, it has been decided to have parachute competitions, the descents to be made from airplanes. Prizes to the amount of 500,000 lire will be awarded in the parachute competitions, which will also be international.

There will be held also a competition for free balloons, the money prizes in this competition amounting to 30,000 lire.

As soon as the detailed regulations governing the above competitions are drawn up information thereon will be forwarded.

Prior to his appointment, the new minister of war was a member of a group of fifty representatives in the Italian house of representatives known as the "Aeronautical Group." This group is made up of representatives from various political parties, organized and pledged to support and assist in all legislative matters for the organization and development of commercial aeronautics. Up to the present time this group has not succeeded in getting any of its proposed legislation through the house. A similar organization has just been organized in the senate along the same lines and for the same purposes. It consists of from 40 to 45 members at present, including many of the most prominent senators, in addition to those who are most prominent in industry and science.

## Camp Nichols, P.I., Now an Air Service Station

THE clearing house for Philippine scout recruits for years—Camp Nichols, P.I.—has been converted into an air service station. The old post has been awakened from its peaceful slumber of contentment, the air service troops are policing up the old post, and the interest they take in it is admirable. The quartermaster corps is employing a gang of natives to clear so much of the camp that is to be converted into a flying field. Large trees and innumerable clumps of bamboo are being uprooted by means of a steam roller. Filling and grading are being done by means of plows and harrows. When the new field is completed it will be as level as a billiard table, and will be approachable from all directions. Camp Nichols is located in the suburbs of Manila, and is considered an ideal station.

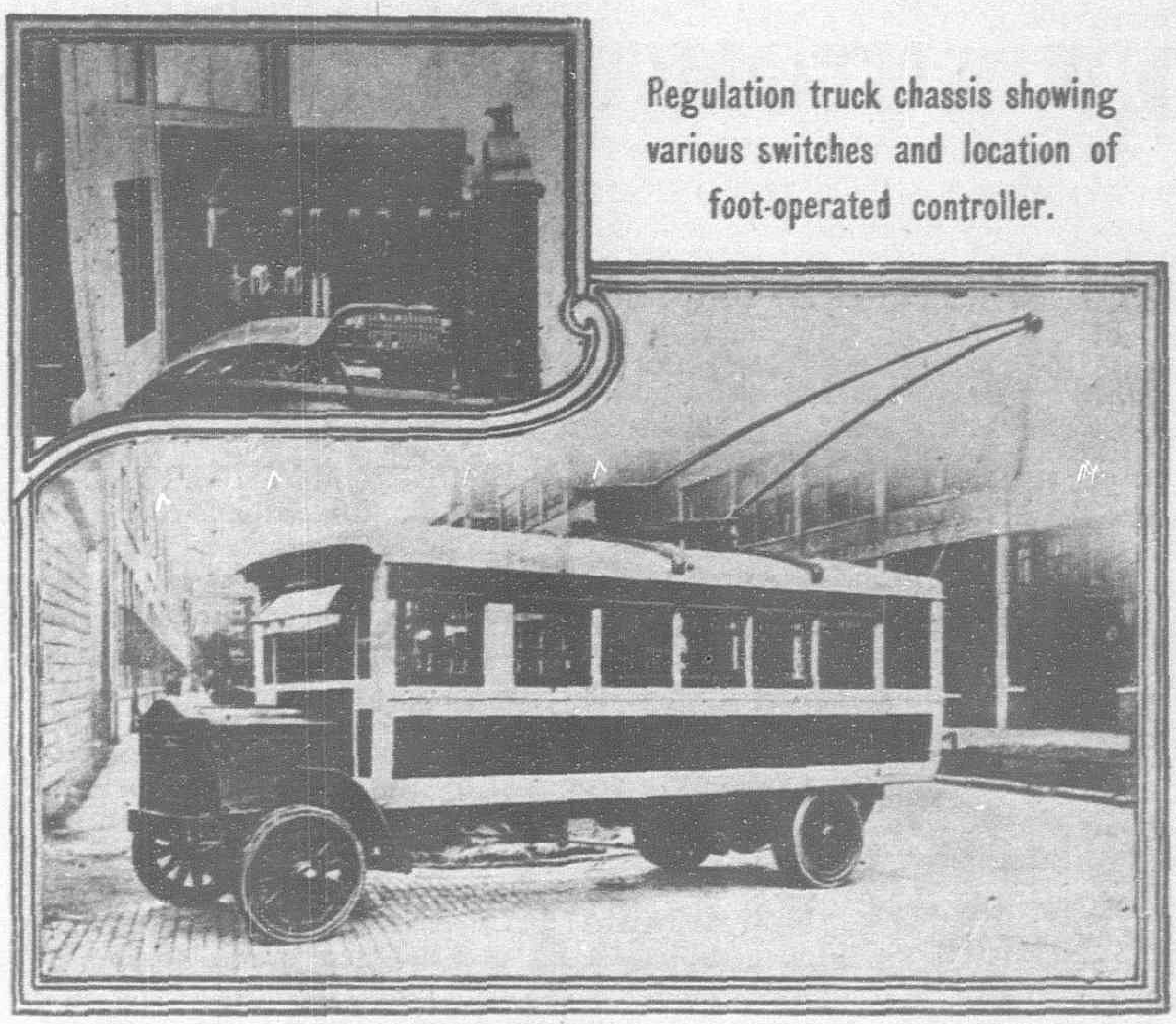
The field is of an "L" shape, the foot of the "L" being slightly over 500 yards in length and the leg of the "L" something over 650 yards in length. The construction of the field for the $5,000 which has just been authorized by the war department will tend to make it one of the most inexpensive fields ever provided for the air service. By having this field and also the $10,000 field to be constructed on Corregidor, all heavier-than-air craft will then be able to fly between, and land at, all stations. The flying field on Corregidor will not be a school airdrome, but one from which service flying can be very readily carried on.

### Italy

The Italian publication *The Matin* reports the invention in Italy of a dirigible carrying 90 passengers and a crew of 23. Instead of employing ordinary gases, the ship is enabled to rise by the rarefaction of the air itself within the machine. The machine was built of duralumin, the lightest kind of metal, and consists of a series of concentric chambers, enabling the air to be rarefied in each to such an extent that it becomes lighter than the air outside and the machine is enabled to rise. The process is carried on by machinery connected with motors, and can be varied so as to enable the ship to rise or fall and move at varied speeds.

### Siam

During his "round-the-world" journeying, Lord Northcliffe made a stay at Bangkok, and on December 23rd he visited the airdrome at Don Muaung, where Sir Ross Smith alighted during his Australian flight in 1919. The London *Times* correspondent states that Lord Northcliffe was surprised to find the air station equal to most of those in Europe. Siam, he states, has 25 landing places and five airdromes. At Don Muaung there are 115 planes, including school machines and a staff of 650 men.



Regulation truck chassis showing various switches and location of foot-operated controller.

## New Vehicle Combines Good Points of Street Car and Gasoline Bus

WITHIN the past few months there has been developed and tested, with satisfactory results, as an adjunct to street car service, the trolley bus, a combination of the gasoline bus and the trolley. The vehicle consists of a regulation bus chassis with a 25-seat body, which is propelled by electric motors, with their control apparatus mounted under the regulation automobile hood. Power is derived from an overhead wire.

From the standpoint of operation the new bus which as now developed has the standard chassis of the Packard truck with electrical equipment furnished by the Westinghouse Electric & Manufacturing Company, has many points in its favor. Two of these reasons follow. Due to its automobile construction it does not need tracks and therefore can draw up to the curb of the street to receive and discharge passengers. It also can dodge with ease trucks or wagons which are directly in its path and thus is not subject to the irritating delays and consequent loss of schedule which constantly interrupt the street car service of nearly every metropolis.

This trolley bus recently tested in Detroit, weighs 11,500 pounds, including two 18-foot trolley poles which may be seen in the illustration. Of the total weight 6,770 pounds is carried on the rear axle so that the weight is very evenly balanced on front and rear axles, a feature that makes the bus very attractive to the transportation official. The propulsion equipment consists of two 25 horse-power Westinghouse ball-bearing motors mounted in tandem and coupled together and to the propeller shaft with flexible couplings.

One feature that the trolley bus has and which permits of one-man operation is a foot controller. The pedal of the foot controller occupies the same place in the cab as the automobile accelerator while the control equipment is located under the hood. In fact the entire appearance of the hood has not been changed an iota, the only difference being that instead of a noisy gasoline engine there is installed electric control apparatus whose silent operation is in direct contrast to the noisy internal combustion engine.

As developed at present the trolley bus is not designed to replace the street car but is merely to act as an adjunct to street car service. It has proved that it is capable of very flexible service and there have been some prophets who go so far as to say that within the next few years the trolley bus will entirely supplant the jitney for city service.

# NEW AUTOMOBILE COMPANIES, ROADS, ETC., IN CHINA

AUTO BUS COMPANY UNDER ORGANIZATION IN HONAN.—The ministry of communications has received an application from Mr. Lee Mao-ping asking for permission to organize an auto bus company, to operate a service from the mouth of the Lan-feng-ho river to Tsi-yuen, Honan, with a capital of $50,000. The application has been referred to the provincial authorities of Honan for investigation, and if satisfactory, approval will be granted.

AUTO BUS SERVICE ON CHEFOO-WEIHSIEN MOTOR ROAD.—Since the notification was issued by the ministry of communications calling for reliable merchants to operate an auto bus service on the newly-built Chefoo-Weihsien motor road on franchise, two Chinese capitalists named Chang and Chiang have applied to the provincial authorities of Shantung asking for permission to undertake the enterprise with a capital of $1,250,000. The request is now under consideration by the ministry.

A MODERN ROAD IN SZECHUAN.—The survey of a modern road from Chengtu to Chungking, which is proposed by the Chungking port improvement works bureau, has been started, Mr. Chow Tsing has been appointed to take charge of the bureau.

MOTOR SERVICE BETWEEN KALGAN AND TU-LUN-HSIEN.—The motor service company established by the defence commissioner at Kalgan for running automobiles between the city and Tu-lun-hsien, an important town in Jehol, has recently inaugurated its service. The journey can be finished in one day's time and the single fare for each passenger is charged at $20, each passenger being allowed to carry parcels not exceeding 20 catties in weight.

GOOD ROAD MOVEMENT STARTED BY FOREIGNERS.—The American consul-general at Nanking has lately written to the military and civil governors of Kiangsu, asking for approval of the plan formulated by the Chinkiang Chinese and foreign famine relief association for the construction of a motor road from Chinkiang to Tong-shan at Nanking with famine sufferers' labor.

CONSTRUCTION WORK ON CHEKIANG-FUKIEN PROVINCIAL ROAD STARTED.—An engineering conference of the Chekiang provincial roads bureau was held on March 18th to discuss the necessary measures to be taken in connection with the proposed work. In the conference, it was decided that the Chekiang-Fukien line would be started on March 22nd and that three road construction sub-departments will be established at Hsiao-shing, Linghai and Yung-chiar respectively.

SHANGHAI - MINGHONG - NANWEI - CHOLING AUTOMOBILE ROAD TO BE PROLONGED.—The Shanghai-Minghong-Nanwei-Choling Automobile Transportation Company is planning to prolong its line from Choling to Chapoo and Haining, two important towns in Chekiang, where marine products are abundant and adequate means of transportation are urgently needed. There is a long embankment leading to Haining from Choling and part of it can be made use of for running the automobile service.

CONSTRUCTION COST OF CHEKIANG-ANHWEI PROVINCIAL ROAD.—After careful survey by Mr. Chen Shu-tang, engineer-in-chief, it is estimated that the Chekiang-Anhwei provincial road from Chien-tang-men, Hangchow, to Sze-an-ching, Wuchow, a distance of 234 *li*, will cost $1,170,000 or an average of $5,000 per *li*. On the whole line there will be constructed 67 bridges calling for an expenditure of $600,000 of which one-third will be spent in building two large bridges over Mai-chee in An-kien-hsien and over Nan-chee in Wu-kong-hsien, each with a length of 300 feet. According to the estimate, a total amount of $2,000,000 will be needed in the work including the purchase of auto buses, construction of stations, offices, etc.

SHORT MODERN ROAD UNDER CONSTRUCTION, ANHWEI.—With an appropriation of $100,000 by the Chinese and foreign famine relief association, the construction of an automobile road from Hwai-yuen to Pengpu, Anhwei, a distance of little more than 20 *li*, has been started.

AUTOMOBILE ROAD IN WESTERN HONAN PLANNED.—The military and civil governors of Honan have decided to construct an automobile road between Kwai-ying-dong to Dong-kwai in place of the railway, as the construction of the former will call for a smaller expenditure than that of the latter. Two engineers, Messrs. Hwang Pao and Liu Jen, have been sent to make survey of the road and construction work will be started very soon.

AMALGAMATION OF TWO PROPOSED AUTO BUS COMPANIES.—The Soochow Automobile Transportation Company promoted by Mr. Pan Tze-nee, of Soochow, will be amalgamated with the Soochow-Kashing-Wuchow Automobile Transportation Company which is now under organization.

AUTO BUS SERVICE, NANTUNGCHOW.—The Nantungchow road construction department has decided to introduce automobile transportation service into the whole district of Nantungchow ; at present auto bus service is only operated in the Cheng-kong, Shan-zai and King-sha-sze villages.

NORTH MANCHURIA AUTOMOBILE TRANSPORTATION CO. PROPOSED.—Mr. Chi Hung-kwai, a wealthy merchant of Heilung-kiang, has proposed the organization of the North Manchuria Automobile Transportation Company with a capital of $100,000 to operate a service between Tsitsihar, Harbin, Tao-nan and other important places in North Manchuria.

DUN-CHEE-YUEHONG AUTOMOBILE ROAD PROJECTED.—Some leading merchants of Hwei-chow, Anhwei, have proposed the building of an automobile road from Dun-chee, Anhwei, to Yuehong, Chekiang. As there are many hilly districts between the two pints, the work will involve engineering difficulties and, according to estimate will call for an expenditure of about $1,500,000.

1,010-LI MODERN ROAD UNDER PROJECTION IN KWANGTUNG.—The important merchants of Chao-ching-fu, Kao-yao-hsien, Kwang-ning-hsien and many other neighboring districts in Kwangtung are contemplating the building of district roads in 80 sections, with a total length of 1,010 *li* extending to twelve cities in the province. When completed, these projected roads will lead to the Canton-Samsui and Ning-Yang railways. A detailed map showing all the roads has been submitted to the provincial authorities for approval.

NEW BRIDGES ON GEEHSIEN-TINGHSIANG-WUDAN AUTOMOBILE ROAD.—On the Geehsien-Tinghsiang-Wudan motor road, Shansi, stronger bridges will be built so as to allow heavy freight trucks to pass. The fund for the purpose is to be appropriated by the three districts concerned.

AUTO BUS SERVICE BETWEEN NANTUNGCHOW AND HAIMEN.—A number of automobiles have been ordered from Shanghai by the Nantungchow-Haimen Automobile Transportation Company, recently organized by the leading merchants of the two cities. It is expected that service will be inaugurated at the end of this month.

TSINAN-LOKOW AUTOMOBILE ROAD OPENED TO TRAFFIC.—The automobile road from Tsinan to Lokow, Shantung, has been completed, and automobile transportation service was started on March 27, 1922, by Messrs. Lao Sun-wu and Sung Po-shan.

SIAN-DUNGKWAI AUTO BUS COMPANY PLANNED.—Mr. Woo Kwang-shee, chairman of the Shensi provincial assembly, and Mr. Kuo Yu-chong, chairman of the chamber of commerce at Sian, have planned the organization of an automobile transportation company to operate a service from Sian to Dungkwai. It is reported that the proposal has received the favorable approval of the military and civil governors of the province.

AUTO BUS SERVICE BETWEEN SHANGHAI AND WOOSUNG.—Some time ago it was proposed to establish an automobile company operating a service from Shanghai to Woosung, but the plan was dropped owing to the fact that the newly-built road was not solid enough for such an enterprise. With repair works carried out during the past two years, the conditions of the road have been greatly improved and some Chinese capitalists are again planning to take up the long-proposed enterprise. An engineer has been appointed to investigate the conditions of the road.

AMERICAN PHILANTHROPISTS TO BUILD MOTOR ROAD IN CHINKIANG.—Upon request of the Chinese and Foreign Famine Relief Association at Chinkiang, the American consul-general at Nanking has written to the military and civil governors of Kiangsu asking for permission to construct a motor road from Chinkiang to Tong-sui connecting with the existing Tong-sui—Nanking automobile road with famine sufferers' service under direction of the association.

SHANGHAI - MINGHONG - NANWAI - CHOLING AUTOMOBILE ROAD.—The construction work on the Shanghai-Minghong-Nanwai-Choling automobile road has been started and it is expected that the first section between Shanghai and Ming-hong will be completed in May and that automobile service will be inaugurated on June 1st with eight buses.

NANTUNGCHOW-SHUKAO-HAIMEN AUTOMOBILE TRANSPORTATION COMPANY.—With the district roads in Nantungchow, Shu-kao and Haimen, Kiangsu completed, the gentry of these three neighboring cities have decided to organize an automobile transportation company to run a service between these cities. The company is capitalized at $15,000 divided into 300 shares of $50 each. It is reported that five automobiles have been ordered from Shanghai and that the shipment will arrive at Nantungchow in the near future.

AUTOMOBILE ROAD BETWEEN KIUKIANG AND CHING-TEH-CHING, KIANGSI.—An automobile road from Kiukiang to Ching-teh-ching, the most famous porcelian centre of China, will soon be constructed by the leading merchants of the two cities. The projected line measures bout 200 *li* in length and when completed the journey will take four hours. According to estimate, a fund of $1,000,000 is needed for constructing the road and the purchasing of auto buses. At present an amount of $100,000 has been collected and the balance is being raised in the leading cities of the province.

REGISTRATION OF SHANGHAI-TAITSANG MOTOR SERVICE COMPANY.—The Shanghai-Taitsang Automobile Transportation Company, which has inaugurated a service from Shanghai to Tazang on January 1st, has been officially registered with the ministry of agriculture and commerce. At its recent shareholders' meeting, it was decided that the automobile road would be prolonged from Taitsang if the daily receipt exceeds $300 during the forthcoming three months after through service starts.

AUTOMOBILE ROAD FROM ANKING TO ZIH-YIEN-KWAI.—The Anhwei provincial road construction bureau has started to build an automobile road from Anking to the North suburb known as Zih-yien-kwai, a distance of 25 *li*, with famine labor. An appropriation of $20,000 has been made by the Anhwei civil governor, but according to estimate the fund allocated is not enough to cover the expense.

It is learned that parallel to the automobile road now under construction, there will be built another macadamized road on which heavily loaded freight cars are allowed to pass.

SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—A temporary office of the Soochow-Kashing-Wuchow Automobile Transportation Company has been established. The company is capitalized at $3,000,000 divided into 150,000 shares of $20 each. According to estimate, when the motor service is inaugurated, a net profit of $1,050,000 will be made annually.

It is learned that another automobile road from Sze-an-ching in Chang-shun-hsien, terminus of the Soochow Kashing-Wuchow line, to Kwang-teh-hsien in Anhwei will be built, connecting with the Soochow-Kashing-Wuchow line.

HANGCHOW-YUEHONG AUTOMOBILE ROAD.—The Hangchow-Yuehong Automobile Transportation Company, which is under organization, has been officially registered with the Chekiang provincial government and is now soliciting subscriptions for capital. The company is to be capitalized at $300,000 with 60 shares of $50 each. Up to date, an amount of over $200,000 has been raised.

PLAN AUTOMOBILE SERVICE BETWEEN YUEHSIEN AND HSUCHONG.—The gentry of Yuehsien and Hsuchong, Honan, have decided to establish an automobile transportation company to run a service between the two cities. The automobile road is under construction and is expected to be opened to traffic in May, 1922.

AUTOMOBILE SERVICE IN SHANTUNG.—The Tsinan-Lokow Automobile Transportation Company, Shantung, inaugurated its service on March 1st with about ten buses, each capable of accommodating 20 passengers.

The motor road from Yu-chen to Tung-chong, which was constructed by the American red cross, has been handed over to the Shantung provincial authorities. It is learned that a certain Mr. Pao has applied to the Chinese officials for the operation of a motor service on the red cross road and that his application has been received favorably.

CHONGCHOW-SHIHCHIACHONG SECTION TO OPERATE MOTOR SERVICE.—Mr. Chang Ching-jao has applied to the ministries of agriculture and commerce and communications asking for permission to operate an automobile service on the proposed railway line from Chongchow to Shihchiachong, Chihli, of which the foundation work has been completed.

MOTOR ROAD TO CONNECT NANTUNGCHOW WITH SHUKAO.—With a view to facilitating communications, the gentry of Nantungchow and Shukao, two neighboring districts in Kiangsu, have planned the construction of an automobile road between the two districts. A survey is being carried out and construction work will be started very soon.

MARKET FOR MOTOR VEHICLES IN CHEKIANG.—A number of auto buses will be soon ordered for service on the projected Chekiang-Fukien provincial road, Chekiang-Anhwei provincial road, Hangchow-Yuhong, Haining-Changan and Ningpo-Fenghua-Chinghai automobile roads, some of which are under construction. Mr. Yue Teh-lan, engineer-in-chief, has taken the matter of purchasing buses with the military governor of Chekiang.

CHEFOO-WEIHSIEN AUTOMOBILE ROAD.—The ministry of communications has drawn up a set of regulations containing seven articles governing the management of the Chefoo-Weihsien automobile road and the organization of an automobile transportation company to operate a service thereon on franchise.

LUNGKOW-WEIHSIEN AUTOMOBILE ROAD COMPLETED.—The Lungkow-Weihsien automobile road in Shantung had been completed and auto-bus service thereon was inaugurated on March 1st, 1922.

MOTOR ROAD COMPLETED AT NANTUNGCHOW.—An automobile service has been inaugurated on the Shan-maloo road, Nantungchow.

CONSTRUCTION OF HANGCHOW-YUHONG AUTOMOBILE ROAD PROGRESSING.—The Hangchow-Yuhong Automobile Transportation Company, organized by Messrs. Koo Nai-ping and Chang Ying-ching, with a capital of $300,000 divided into 6,000 shares of $50 each, has recently secured registration with the ministry of communications. The projected line is to start from Kwai-ying-jao, Ho-sze, Hangchow, and end at the suburb of Yuhong. Two large stations will be established at Hangchow and Yuhong with smaller ones at Ho-sze, Tung-ngao, Liu-sha and Yen-ling-poo. At present offices have been established at Pan-er-hong, Hangchow, and Hsiao-lung, Yuhong, respectively.

PEKING TIENTSIN AUTOMOBILE ROAD.—The construction of the Peking-Tientsin automobile road has been started under direction of the local police authorities and Mr. Hsuan Shee-ling.

TRANSPORTATION FACILITIES IN CHENG-KIANG, KIANGSU.—An automobile transportation company is being organized to operate a service from Wusih to Cheng-kiang, by the local authorities.

TWO IMPORTANT HIGHWAYS IN HUPEH, PROPOSED.—Mr. Pao Ching-yue has proposed the construction of two important automobile roads in Hupeh, one from Hsiang-yang to Shatze and the other from Hsiang-yang to Kwang-sui viâ Ying-shan, connecting with the Peking-Hankow railway. The proposal is under consideration by the local authorities.

ROAD CONSTRUCTION IN SZECHUAN.—Under the leadership of Mr. Chow Ching, the director of the Szechuan provincial road bureau, the construction of the important highway from Chengtu to Chungking is steadily going on. Another modern road at Kiang-pei has been started.

AUTO-BUS SERVICE ON NEWLY-BUILT CHEFOO-WEIHSIEN ROAD.—In reply to the advertisement of the ministry of communications calling for reliable merchants to operate an auto-bus service on Chefoo-Weihsien motor road on franchise, Messrs. Chang Shi-gee and Chiang Pong-song, general manager and assistant manager of the Lungkwo Port Construction Company, at Lungkow, Shantung, have applied to the provincial authorities of Shantung for the privilege. The request has been referred to the ministry of communications for consideration.

SOLDIERS ASSIGNED TO CONSTRUCT CHEKIANG-FUKIEN PROVINCIAL ROAD.—The construction of the Chekiang-Fukien provincial road has been started with 3,400 soldiers under control of General Lu Yung-Hsiang, tuchun of Chekiang. The line is divided into 17 sections as follows.

(1) From Tih-ling-kwai, Si-shun, to Chien-ching-ching, 40 *li*.
(2) From Chien-ching-ching to the city of Hsiao-shun, 45 *li*.
(3) From the city of Hsiao-shun to Sung-chiar-zai, 36 *li*.
(4) From Sung-chiar-zai to Tso-yuen-der, 26 *li*.
(5) From Tso-yuen-der to the city of Chen-hsien, 25 *li*.
(6) From the city of Sing-cheng-hsien to Kwai-ling, 52 *li*.
(7) From Kwai-ling to Tien-den-hsien, 40 *li*.
(8) From Tien-dan-hsien to Chung-doo-ching, 50 *li*.
(9) From Chung-doo-ching to Ling-hai-hsien, 50 *li*.
(10) From Ling-hai-hsien to Hwang-ngai-hsien, 52 *li*.
(11) From Hwang-ngai-hsien to Shih-kuo-ching, 50 *li*.
(12) From Shih-kuo-ching to Song-gee-kong, 40 *li*.
(13) From Song-gee-kong to Ching-kiang-doo-kow, 40 *li*.
(14) From Ching-kiang doo-kow to Liu-sze-ching viâ Hung-jao-ching, 55 *li*.
(15) From Liu-sze-ching to Wenchow, 50 *li*.
(16) From Wenchow to Ting-dien-ching in Sui-an-hsien, 40 *li*.
(17) From Ting-dien-ching to Ping-yang-hsien, 50 *li*.

DUNGCHEE-HANGYUE AUTOMOBILE COMPANY PROPOSED.—Some Anhwei merchants residing in Shanghai such as Messrs. Woo Dih-ching, Lee Tan-foo, Wang Zing-poo, etc., have proposed the organization of an automobile transportation company with a capital of $1,500,000, with 30,000 shares, for operating a service from Dungchee, a town in Hweichow, Anhwei, to Hangyue, Chekiang, viâ Yue-chien and Chong-hua in Chekiang.

SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—The Soochow-Kashing-Wuchow Automobile Transportation Company which is under organization will amalgamate with the Soochow Auto Bus Service Company proposed by Mr. Pan Tze-nee. The projected lines have been re-adjusted as follows:

(1) The Soochow-Kashing main line is to start from Soochow and end at Cha-poo, Chekiang, viâ Woo-kiang, Ping-wang, Pei-cha, Chen-shih, Wang-kiang, Ka-shing, Sing-foong and Ping-ho, with a branch line from Dung-ting to Dung-hsiang viâ Tung-shan, Kwang-foo, Dung-lee, Li-lee and Po-yuen.

(2) The Soochow-Wuhu main line is to start from Soochow and end at Kwang-teh, Anhwei viâ Woo-kiang, Pei-cha, Tseng-shih, Nan-zing, Ju-kwai-tze, Wu-chow, Chang-shun and Sze-an, with a branch line from Wu-ching to Hangchow viâ Liang-ho, Sing-tze, Wu-kong and Tien-mo-shan.

(3) The Soochow-Taichong main line is to start from Soochow and end at Taichong, connecting with the Shanghai-Taichong line.

(4) The Soochow-Changzao main line is to start from Soochow and end at Foo-shan-ching viâ Changzao with a branch to Tong-kow.

MODERN ROADS IN ANHWEI.—At a recent meeting of the provincial road construction bureau of Anhwei, four important provincial highways were mapped out:

(1) From Anking to Chin-teh-ching, Kiangsi, viâ Tung-liu and Chiu-poo.
(2) From Wuhu to Kwang-teh viâ Hsuan-chen and Long-chee.
(3) From Wuhu to Tun-chee-ching viâ Shih-dien, Tai-ping, Tsing-teh, Tsi-chee, Shi-hsien and Shu-ning.
(4) From Anking passing through Sze-chen and Hur-vee, thence one line leading to Loa-an and another to Pengpu.

Of the above proposed roads, the ones from Wuhu to Kwang-teh, Anking to Loa-an and Anking to Pengpu will be built first, as the local gentry have decided to take up the construction work.

Another motor road from the north suburb of Anking to Feng-sui-poo viâ Wu-lee-tun and Chih-yien-kwan, a distance of 25 *li*, is also being considered. This road, though rather short in distance, is a most important highway leading to the capital of the province, and construction work on it will be soon carried out with famine sufferers' labor. For facilitating communication, another automobile road surrounding the city of Anking will be built.

AUTOMOBILE SERVICE IN SHANSE.—Automobile transportation services from Taiyuenfu to Cheng-hsien viâ Gee-hsien and Wu-dan in the north and from Taiyuenfu to Pin-yao viâ Feng-yang and Chi-hsien in the south, Shansi, were officially inaugurated on April 15.

MOTOR SERVICE COMPANY PROPOSED IN SHANTUNG.—Mr. Ma Vee-yien, of Shantung, is associated with a number of capitalists for the organization of an automobile transportation company to run a service from Tsining, Shantung, to Kaifeng, Honan. It is stated that automobiles have been ordered from Tientsin.

AUTOMOBILE TRANSPORTATION SERVICE IN SHANG-TSAI-HSIEN.—A motor road from Si-ping to Chow-chiar-kow in Shang-tsai-hsien, Honan, has been completed and an automobile transportation company to operate a service on the new road has been established with a capital of $50,000. A shipment of more than ten auto buses has been supplied by the Jardine, Matheson & Co. at Hankow, and service will be inaugurated very soon.

CHENGTU-KWAIHSIEN AUTOMOBILE ROAD STARTED.—The construction work on the Chengtu-Kwaihsien automobile road, Szechuan, a distance of 120 *li*, which is to have a width of 18 feet and is to be macadamized, has been started. The construction of another important line from Chengtu to Chungking will be postponed for some time.

AUTOMOBILE SERVICE BETWEEN WEIHSIEN AND LUNGKOW, SHANTUNG.—Automobile service from Weihsien to Lungkow, Shantung, has been inaugurated. Incompletion of a bridge over the Hwai-ho, still necessitates the use of ferry boats at this point.

TWO AUTOMOBILE TRANSPORTATION COMPANIES UNDER ORGANIZATION.—Mr. Lee Hung-ping of Honan and Mr. Chang Ching-jao of Chihli have applied to the ministry of communications for permission to organize the Kaifeng-Tsiyuen Automobile Transportation Company and the Chongchow-Shihkaichong Automobile Transportation Company respectively.

CHING-TSI-HWANG-CHIAO AUTOMOBILE TRANSPORTATION COMPANY.—Messrs. Kuo Ping, Wai Hsiao-yu, Lu Ting-liang and others have organized an automobile transportation company to operate automobile services from Ching-hua to Chiao-wai-ying and from Hwang-ho-jao to Tsi-yuan. The company will not construct any motor road but will rent the old roads from the Honan provincial government on franchise. However, it is necessary for the company to repair the road along the projected line. The line is 280 *ii* in length, 5 per cent. of the total yearly profits will be paid by the company as rent. Some branch lines are under consideration, of which, the one from Ching-hua to Sing-yang-hsien will be constructed first. The company is capitalized at $150,000 in 300 shares of $500 each and has been officially registered with the Honan industrial bureau.

The estimated expenditures in connection with the enterprise are given in the following itemized statement:—

*Cost of Land.*—The cost of land for constructing the road from Chiao-wai-ying to Ching-hua and for stations, offices and auto-bus sheds is estimated at $10,000.

*Earthwork.*—Earth required for widening, filling and grading the new road and some parts of the old roads will cost about $10,000.

*Surfacing.*—Gravel for surfacing the old roads and the new road from Ching-hua to Chiao-wai-ying will cost about $10,000.

*Bridges.*—Three bridges are to be built and are estimated to cost $10,000.

*Buildings.*—Sixteen stations, auto-bus sheds and machine shops will be erected and are estimated at about $10,000.

*Automobiles and Road Roller.*—Four passenger cars at $7,000 each, four trucks at $5,000 each, two small cars at $1,000 each and one road roller at $1,000 will be purchased, making a total of $55,000.

*Tree Planting.*—About 24,000 trees will be planted along the road, at an expenditure of $1,000.

*Furniture and Fixtures.*—Telephones, allowances to police stations for additional policemen, surveying apparatus, furniture and fixtures for the various stations are estimated at $10,000.

*Reserve Fund.*—A fund of $14,000 is set aside to provide for deficits in the above itemized costs.

ESTIMATED EXPENDITURES IN CONNECTION WITH THE CONSTRUCTION OF THE SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—The estimated costs of building the Soochow-Kashing-Wuchow highway are placed at about $3,000,000, given in the following itemized statement:—

*Cost of Land.*—About 8,340 *mow* of land will be required for constructing the road measuring 696 *li* long and 40 feet wide, estimated at $50 per *mow*, or a total of $417,000. Other expenses and allowances for the removal of tombs, houses, etc., the total cost of land is placed at $440,000.

*Earthwork and Surfacing.*—A total of about 500,400 *fond* of earth is estimated as necessary for filling, grading, etc., costing about 60 cents per *fond* including cost of sand for surfacing, or a total of $600,480.

*Stone and Gravel.*—The road is to be covered with gravels on which two stone rails, each with a width of 1-ft. and a depth of 5-in. will be laid. It is estimated at $300 per *li*, or a total of $208,500.

*Bridges.*—There will be built 253 bridges which is placed at $506,000, at an estimated average cost of $2,000 each.

*Automobiles.*—100 passenger cars at $6,000 each and 60 trucks at $4,000 each, a total of $840,000.

*Buildings.*—The ten large stations at Soochow, Pingwang, Kashing, Chapoo, Nanzing, Wuchow, Chang-shun, Kwang-teh, Taichong and Changzao, which are to have offices and dormitories attached, will cost $50,000 and the small stations at other places will cost $25,000, making a total of $75,000.

*Tree Planting.*—About 100,000 trees will be planted along the road calling for an expenditure of $10,000.

*Furniture and Fixtures.*—Telephones, allowances to police stations for additional plicemen, surveying instruments, furniture and fixtures for the various stations are estimated at $80,000.

*Road Rollers.*—Four 9-ton road rollers at $10,000 each.

*Reserve Fund.*—A fund of $200,020 is set aside to provide for deficits in the above itemized statement.

When all the itemized estimates are added up, the total amounts to $3,000,000.

PROVINCIAL ROADS IN SZECHUAN.—In Szechuan province there will be built six important provincial roads which have been mapped out as follows:—

(1) From Chengtu to Chungking.
(2) From Chengtu to Van-hsien.
(3) From Chengtu to Ka-ting.
(4) From Chengtu to Kong-ting with a branch line from Han-yuen to Hwai-lee.
(5) From Chengtu to Kwai-hsien.
(6) From Chengtu to Kwang-yuen.

All of these projected roads are to have a width of 30 feet. The two lines from Chengtu to Chungking and from Chengtu to Kwai-hsien are to be built first under directorship of Gen. Chow Ching and Gen. Liu Chen-hsuan respectively. Besides these provincial roads, a number of district roads will be constructed. The fund for the work will be raised by issuing a public loan in the province.

REGISTRATION OF AUTOMOBILE TRANSPORTATION COMPANY.—The Hangchow-Yuehong Automobile Transportation Company which was promoted last year by Mr. Koo Nan-ping has been officially registered with the Chekiang provincial road construction bureau. Survey of the proposed road has been completed.

PROVINCIAL ROADS IN SOUTHERN FUKIEN.—The provincial road from Shih-mar to Chong-chow in Fukien has been opened to traffic, and another important road from Fur-kung to Chong-chow has been completed. At present the journey from Chong-chow to Amoy takes only three hours by automobile.

SOOCHOW AUTOMOBILE TRANSPORTATION COMPANY UNDER ORGANIZATION.—The Soochow Motor Service Company is being organized by Mr. Pan Lee-kuo with a capital of $52,000. An application for approval and registration has been made to the local authorities.

KIU TAH AUTOMOBILE TRANSPORTATION COMPANY.—Messrs. Yuen Chien-tze, Kao Yih-ting and Lee Chao-chu, of Chow-kow-ching in Sih-yih-hsien, Honan, are planning to organize the Kiu Tah Automobile Transportation Company to run a service from Chow-kow-ching to Len-ho, Honan.

# Aviation Development in Italy

A POLICY of strict economy in army expenditures is to be inaugurated by the new Italian minister of war, the Hon. Gasparotto, who has been in office about five months. Both military and civil aeronautics in Italy are under the minister of war, and he recently made the following statement of his intentions concerning the air service:—

"It is my intention to cut down all branches of the army including the air service. The military air service will be kept within the limits strictly essential for proper war preparation. The development of civil aviation must be undertaken on a large scale. In this manner the appropriations for aeronautics will not be wasted in industrial ventures of which the state is always a most unfortunate administrator. The appropriations are to be spent wisely; for specific experiments, for the purchase of new material, for the preparation of the personnel and for equipping the various branches of the air service. As far as possible recourse will be had to private enterprises, stimulated by free competition, rather than to government establishments which are a burden to the state and are apparently kept up to maintain the employees in service. The plan for reforming and reorganizing the air service has been drawn up by the advisory committee for aeronautics, but the army air service must be duly considered and any reorganization must go hand in hand with the army organization.

"Civil aviation will receive the greatest possible support from the government, but always with the idea of developing and in full co-operation with the military air service. Thus, with a minor expenditure of money there will be created not only a strong air service for Italy's possible future defense, but also a source of industrial wealth and a large exportation."